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Three Roads Place

Pendulum Cars in Service

Santa Fe, Great Northern and Burlington each receive one of the new Hill cars with stressed-skin bodies spring-supported above the center of gravity

THE Hill pendulum-type passenger car, first constructed and placed in test service by the Pacific Railway Equipment Company, Los Angeles, Cal., early in 1938, has been further improved and three new cars recently delivered, one to the Atchison, Topeka & Santa Fe, one to the Great Northern and one to the Chicago, Burlington & Quincy. These cars are all de luxe chair cars, or coaches, practically identical in size and structural design, the only difference being in interior arrangement. The Santa Fe car, with 9 ft. 9 in. in one end devoted to men's rooms and a total of 11 ft. in the other end utilized for women's lounge and wash rooms, has a seating capacity in the coach section of 56. The Burlington car, with slightly less lounge space, seats 60. The Great Northern, with a single 6-ft. 1-in. wash room for men and another for women in one end of the car, has a seating capacity of 68. A 3-ft. 8-in. space on either side of the center aisle above the truck support springs is devoted to locker space in each car. The coupled car length is 85 ft. and light-weight 109,000 lb.

Car Bodies Suspended Above the Center of Gravity

The object of developing the pendulum-type car has been to produce a car-body suspension system which will give the requisite insulation against vibration and maintain stability, these goals being achieved in conjunction with maximum comfort at high speed on ordinary track with safety and economy of weight. In taking curves above superelevation speeds, the outward force acting on the center of gravity causes the car body to move pendulum-wise, adding effectively to the superelevation of the track insofar as comfort and stability within the car are concerned. The actual support at each end of the car is at two points on either side of the center line, a third attachment between the truck and the car body below the floor level serving to position the truck longitudinally with respect to the car body. No objectionable interference with normal use of the car interior is introduced by this method of suspension. The desired motions are provided by flexure of the support system, suitably positioned and restrained. In the present form, all motions between the truck and car body occur solely through elastic flexure, leading to a simple lightweight truck and suspension system.

The car body rests on soft-action coil springs which are recessed into the car structure on either side of the center aisle. These springs carry only vertical load and allow within limits of safe stress sufficient horizontal movement of the top relative to the bottom for all lateral and turning movements of the truck in normal service. Lateral movement of the car body floating on the main springs is restrained by control arms and links which act on the body above the center of gravity. The control arms are flat-leaf steel springs with progressive stops which give a variable spring rate for lateral motion so that the car floats about a center position with small restraint, equivalent to the action of very long swing hangers and is brought to a yielding stop for large, lateral swings.

The longitudinal position of the truck is maintained by the thrust tube or "wagon tongue" which is anchored in rubber near the center of the truck frame and at the other to the car underframe. The rubber mountings of the longitudinal tie permit lateral movement and angular movement of the truck on curves, and constitute barriers against noise transmission. The coil spring suspension involves no sliding or rotating parts carrying the weight of the car. The elements which have been described replace the center plate, side bearings, bolster, chafing plates, bolster springs, spring plank and swing hangers used in all standard passenger-car trucks.

Principal Dimensions, Weights and Seating Capacities of New Pendulum Car

Salable seats:	
Santa Fe	56
Great Northern	68
Burlington	60
Coupled length, ft.-in.	85-0
Length over body end posts, ft-in.	82-8
Length between truck centers, ft.-in.	60-0
Overall width, ft.-in.	10-0
Inside width, passenger compartment, ft.-in.	9-5
Overall height, ft.-in.	13-5
Inside height, passenger compartment, ft.-in.	8-¼
Height of body suspension above rail, ft.-in.	7-3
Height of center of gravity above rail, ft.-in.	6-1
Truck wheelbase, ft.-in.	9-0
Lightweight of car, lb.	109,000
Weight of two trucks, lb.	31,000
Weight of body structure, lb.	32,000
Weight of equipment and furnishings, lb.	46,000

The successful performance of the experimental trucks indicated that the journal springs should be relatively stiff. The journal coil springs are mounted just above the boxes, and are applied so that some lateral movement can take place between the journal boxes and the truck frame. This movement is permitted by rubber and steel vulcanized pads on the side of the pedestals which are deflected in compression to relieve lateral shocks. The arrangement of parts is different from that used on the experimental cars but the characteristics are the same. The truck frames are arc-welded of high-tensile, low-alloy steel and are stress-relieved before machining.

Large Coil Springs Support the Car Body and Cushion Road Shocks

Eight body springs are used per truck, four on each side. These springs are mounted just above the frame side members and extend upward 26 in. within the body to the body-support structure. The static deflection of 10 in. together with the rubber insulator at the top of the springs with a deflection of ⅜ in. is said to insulate the car body thoroughly from disturbances in the truck. As in the case of the experimental car springs considerable analytical and test work was performed to establish correct relationships between static deflection, working height, and pitch diameter to obtain freedom of lateral

Interior of the Santa Fe coach

movement and stability. In these springs, the greatest lateral movement encountered in normal service increases the working stress near the ends of the coils by 25 per cent.

The lateral springs consist of two plates clamped rigidly to the side of the truck frame extending between the body-support bulkheads to a point above the center of gravity of the body. Rubber-cushioned progressive lateral stops shorten the effective spring length with increased deflection, and thereby increase the spring rate with deflection. Lateral tie rods with rubber-mounted end connections attach the lateral spring to the car body at a point about 20 in. above the center of gravity of the entire body assembly.

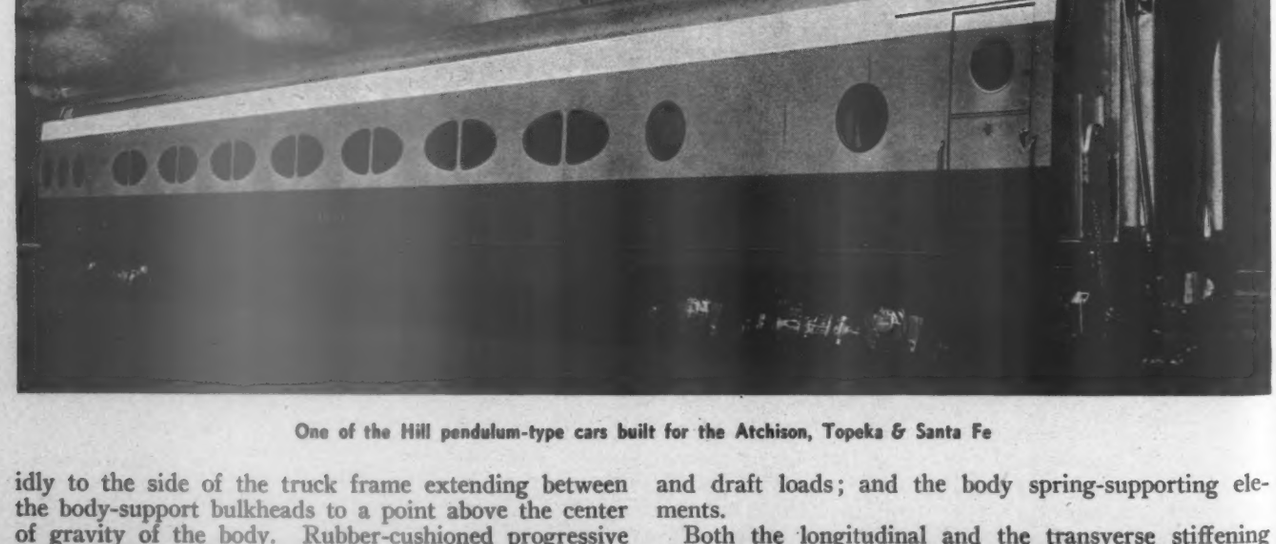
Hydraulic shock absorbers, mounted on the side of the truck frame, are connected by means of long vertical tie rods to the body structure. These two vertical tie rods, also used to hold the truck to the car body in case of derailment or overturning, are designed to meet the Association of American Railroads strength requirement. Hydraulic shock absorbers, mounted in the body-support structure, are connected by means of lateral links to the tops of the lateral spring housings which are rigidly attached to the truck frames at their lower ends.

The truck thrust tube, used to position the truck longitudinally with respect to the body, is connected to the truck through a large rubber fitting at the center of the transom. The body connection of the thrust tube is made through a similar fitting attaching to a bracket mounted directly under the draft-gear pocket. This thrust tube also is designed to meet requirements of the A. A. R. for crash conditions.

The truck wheels, axles and bearings conform to railroad standards for light modern equipment. Wheels are rolled steel, 36 in. in diameter, triple wear. Journal bearings, designed for 5½-in. by 10-in. journals, are of the Timken taper-roller type. Simplex unit-cylinder clasp brake equipment, designed especially for use on this type of truck, is installed.

How the Steel Car Bodies Are Constructed

The essential structural elements of the steel stressed-skin construction embodied in the body of this car are: (1) thin skin or sheathing; (2) longitudinal stiffening members; (3) transverse stiffening carlines at the roof; side posts at the sides; and floor beams, or cross-bearers on the underframe; (4) structural bulkheads through which vertical and lateral loads are transferred to and from the body structure; and (5) miscellaneous structures, such as heavy end frames, essential for housing draft and buff gear; center sill, essential for heavy buff and draft loads; and the body spring-supporting elements.



One of the Hill pendulum-type cars built for the Atchison, Topeka & Santa Fe

Both the longitudinal and the transverse stiffening members are light in weight. They are rigidly fastened to, and act integrally with, the skin. The longitudinally corrugated flooring is a pressed sheet with closely spaced

Pendulum car built for the Great Northern by the Pacific Railway Equipment Company

stiffeners. All of these elements are inter-connected to form an integrated continuous unit.

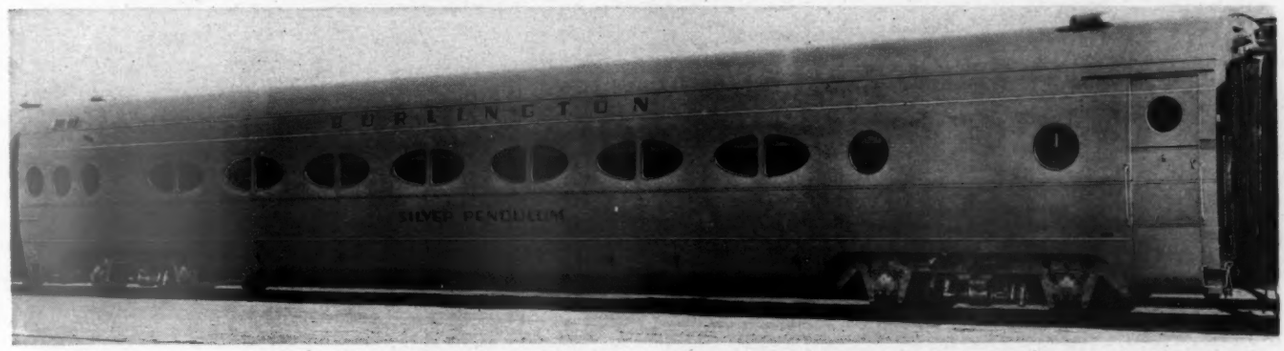
In the interior of the structural shell, there are several features which illustrate the functional importance of this continuity. The longitudinal flooring, one of the most highly worked portions of the structure, is responsible for much of the overall continuity of the design. Considered as a portion of the center-sill construction with the center sill and shear panels, the flooring carries compression loads; heavy concentrations of equipment and live load are distributed over several floor beams. The flooring is also capable of transmitting about 40 per cent of the buff loads from the center construction to the sides of the car, and at the same time carries the live and dead load between the floor beams. The longitudinal stiffening members, with their portion of effective skin, the flooring, and the center sill, supply adequate strength to resist all bending and compression loads.

The support-structure bulkheads transfer uniformly the vertical and horizontal reactions of the truck to the sides and roof of the car. Continuous transverse rings are formed by virtue of the fact that the floor beams are rigidly fixed to the bottoms of the side posts of the side panel, and these side posts are rigidly tied to the carlines of the roof panel. This complete ring around the car is capable of transferring the load on the floor beam to the side sheet, and of withstanding the accompanying thrust, moment, and shear at all points. These rings are designed to prevent spreading or squashing of the thin side and roof sheets when the car is loaded. The curved contour of the body affords a convenient means of transferring load through the structure.

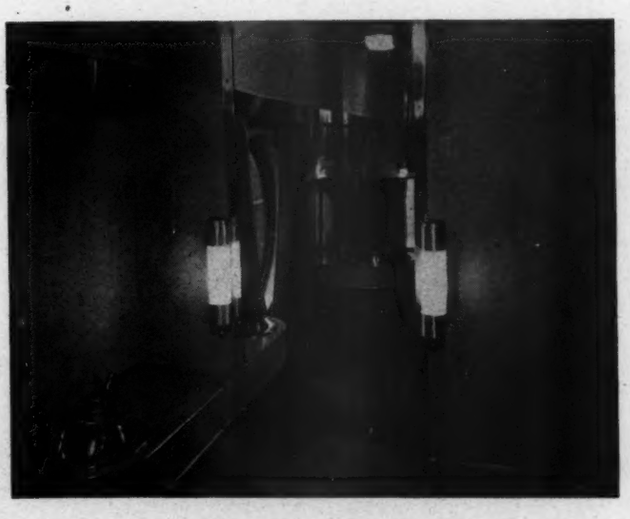
In addition to providing for basic vertical, lateral, buff and draft loads, the car is designed to meet the A. A. R. strength specification requirements.

The Stressed-Skin Steel Construction

Some of the important advantages of the stressed-skin steel construction used in this new car are summarized as follows: The flooring is shear-connected into the structure, making the car body a huge tube, closed at both ends, with a high degree of torsional rigidity. The bending rigidity of the structure is likewise high since all the effective material is disposed as far from the neutral axis as possible. Consequently, under normal operating loads, the maximum stresses in the structure are low. Elliptical windows reduce stress concentrations and increase the shear rigidity of the body.



A Hill pendulum car recently delivered to the Chicago, Burlington & Quincy



In one of the women's dressing rooms

The use of closely spaced longitudinal stiffeners around the entire periphery of the structure, to reduce buckling and increase the total effective width of the sheathing, results in increased collision protection of the passengers, both for end and side loads. The side collision strength is further improved not only by the close spacing of side posts and carlines, but also by the fact that the floor beams, side posts, and carlines are alined and spliced

together to form a series of continuous frames, or rings, throughout the length of the car.

End-collision strength is improved by the large number of longitudinal stiffeners around the entire periphery, as well as by the fact that the corrugated flooring is arranged to have its corrugations parallel to the longitudinal axis of the car. The flooring also has a rigid shear connection to the center sill, so that loads applied to the center sill are distributed to the rest of the car structure.

The entire car body structure, with the exception of the arc-welded end framing, draft gear attachments and miscellaneous connections, is fabricated with controlled spot welding.

Pendulum car truck fabricated by welding and designed to support the car body 14 in. above the center of gravity

Partial List of Materials and Equipment Used on the Santa Fe, Great Northern, and Burlington Pendulum Cars

Steel for car bodies:	
Stainless	Columbia Steel Co., Los Angeles, Calif.
High-tensile, low alloy	Youngstown Sheet & Tube Co., Youngstown, Ohio.
Car bodies	Consolidated Steel Corp., Ltd., Los Angeles, Calif.
Car-body ribs and stiffeners	Van Huffel Tube Corporation, Warren, Ohio.
Car-body springs	American Locomotive Co., Railway Steel Spring Div., New York.
Center sills (stainless steel)	Edward G. Budd Manufacturing Company, Philadelphia, Pa.
Truck frames (SF-GN)	Lukenweld, Inc., Coatesville, Pa.
(CB&Q)	Consolidated Steel Corp., Ltd., Los Angeles, Calif.
Truck molded rubber parts	Gates Rubber Company, Denver, Colo.
Shock absorbers	Houde Engineering Corp., Buffalo, N. Y.
Truck castings	Warman Steel Casting Co., Huntington Park, Calif.
Nuts	Grip Nut Company, Chicago.
	Elastic Stop Nut Corp., Union, N. J.
Wheels and axles (GN-CB&Q)	Bethlehem Steel Co., Los Angeles, Calif.
(SF)	Standard Steel Works Division of The Baldwin Locomotive Works, Philadelphia, Pa.
Roller bearings and journal boxes	The Timken Roller Bearing Co., Canton, Ohio.
Journal-box oil gages (SF)	The Ohio Injector Co., Chicago.
Couplers and yokes (GN)	Buckeye Steel Castings Company, St. Paul, Minn.
(SF-CB&Q)	National Malleable & Steel Castings Co., Cleveland, Ohio.
Draft gear and buffers	W. H. Miner, Inc., Chicago.
Air-brake equipment (GN)	New York Air Brake Co., New York.
(SF-CB&Q)	Westinghouse Air Brake Co., Chicago.
Hand brakes	National Brake Company, New York.
Brake shoes	American Brake Shoe & Foundry Co., San Francisco, Calif.
Clasp brakes, journal and lateral control springs	American Steel Foundries, Chicago.
Lateral control springs	Standard Steel Spring Company, Coraopolis, Pa.
Insulation:	
Car body (SF)	Gustin-Bacon Mfg. Co., Kansas City, Mo.
(GN-CB&Q)	Johns-Manville Sales Corp., San Francisco, Calif.
Dednox	Dednox, Inc., Chicago.
Airacoustic sound	Johns-Manville Sales Corp., San Francisco, Calif.
Pipe—Steam line, hot- and cold-water lines	Johns-Manville Sales Corp., San Francisco, Calif.
Water-line	Union Asbestos & Rubber Co., Cicero, Ill.
Insulation tape, cork board slabs for insulation	Armstrong Cork Company, Los Angeles, Calif.
Folding trap steps and window sashes	O. M. Edwards, Inc., Syracuse, N. Y.
Air-conditioning equipment (CB&Q)	The Trane Co., Chicago.
(SF)	Safety Car Heating & Lighting Co., Inc., New York.
(GN)	Frigidaire Div., General Motors Corp., Dayton, Ohio.
Generators (SF-GN)	Safety Car Heating & Lighting Co., Inc., New York.
(CB&Q)	General Electric Company, Los Angeles, Calif.
Generator mounting supports	United States Rubber Co., Los Angeles, Calif.
Generator V-belt and gear drive (GN-CB&Q)	Safety Car Heating & Lighting Co., Inc., New York.
Anemostats	Anemostat Corporation of America, New York.
Air filters	American Air Filter Co., Inc., Louisville, Ky.
Air grilles for doors	Barber Colman Co., Los Angeles, Calif.

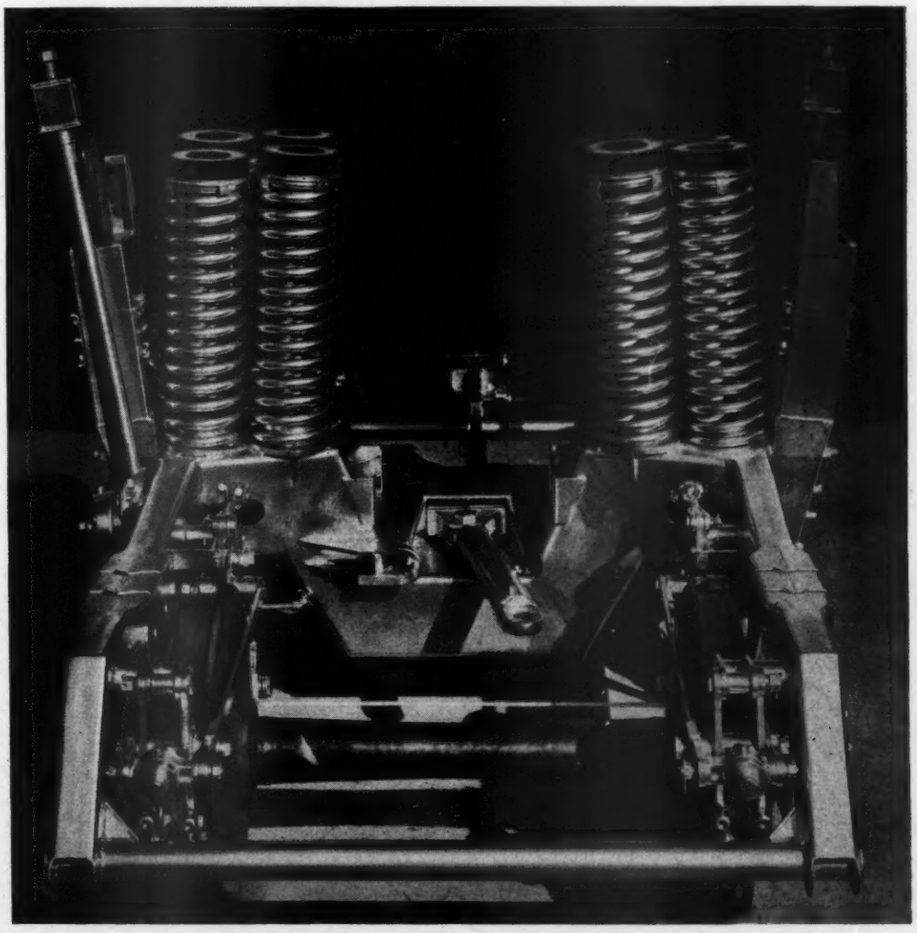
Heating equipment	Vapor Car Heating Co., Inc., Chicago.
Storage batteries	Electric Storage Battery Co., Philadelphia, Pa.
Battery receptacles	The Pyle-National Company, Chicago.
Switchboards, lavatory and vestibule lighting fixtures	Safety Car Heating & Lighting Co., Inc., New York.
Fluorescent bag-rack lighting fixtures, lavatory signs	C. W. Cole Company, Los Angeles, Calif.
Electrical receptacles	Cutler-Hammer, Inc., Los Angeles, Calif.
Electric cable	The Okonite Company, San Francisco, Calif.
Fuse receptacles and electrical train connections	Loeffelholz Company, Milwaukee, Wis.
Vibrator converters	Central Engineering Laboratories, Chicago.
Plywood for floors	Western Hardwood Lumber Co., Los Angeles, Calif.
Fibre wood for wall backing; Plymetl bulk-head panels	Haskelite Mfg. Corp., Chicago.
Armorply partition panels	United States Plywood Corp., Los Angeles, Calif.
Stainless-steel moldings	R. D. Werner Co., New York.
Aluminum extrusion and sheet for ceiling panels	Aluminum Co. of America, Los Angeles, Calif.
Vestibule and end doors	The Morton Mfg. Co., Chicago.
Door closers	P. & F. Corbin, New Britain, Conn.
Door hardware and hooks	H. S. Getty & Company, Philadelphia, Pa.
Door hardware	The Stanley Works, New Britain, Conn.
Door hinges	Loeffelholz Company, Milwaukee, Wis.
Door locks	Dayton Mfg. Co., Dayton, Ohio.
Door latches and holders; window curtains; ash receptacles; diaphragms	The Adams & Westlake Co., Elkhart, Ind.
Car seats	Transportation Seat Co., Mansfield, Ohio.

Other Features—Lighting and Air-Conditioning

The car floors are insulated with a combination of cork, Fiberglas and Airacoustic sound insulation. In the region of the trucks, where sound intensity is high, the exposed surfaces are made sound absorbent to reduce the sound level. The walls and roof are insulated with Fiberglas and Dednox.

The cars have attractive interior appointments and color schemes. They accommodate 56 to 68 passengers in rubber-cushioned, individually controlled reclining seats. The seat spacing is 44 in., or about 2½ in. longer than commonly used in modern chair cars, giving that much additional leg room.

The main passenger compartment in each car is illuminated by fluorescent lamps arranged in a continuous fixture located on each side of the aisle under the nose of the baggage racks. Individual light switches are installed at each seat adjacent to the light fixture. Two incandescent lamps, one white for general illumination and one blue for night lighting, are located in each of the five combination air-outlet and lighting fixtures in the ceiling. Incandescent lamps are used in the vestibule, dressing rooms, toilets and end aisles.



In lieu of a centerplate the longitudinal position of the truck is maintained by a thrust tube attached to the truck transom and the car body through rubber-cushion fittings

Upholstery	L. C. Chase & Co., Inc., New York.
Hoppers and lavatory plumbing fixtures	Dayton Mfg. Co., Dayton, Ohio.
Lavatory traps and piping; steam-heat, air and water piping	Crane Co., Los Angeles, Calif.
Electric water coolers	Tested Appliance Company, Chicago.
Paper-cup dispensers	Dixie-Vortex Co., Chicago.
Welding rod	The Lincoln Electric Co., Cleveland, Ohio.
Wrecking tools	Crear, Adams & Co., Chicago.
Fire extinguishers	Pyrene Mfg. Co., Newark, N. J.

NOTE:
SF—Atchison, Topeka & Santa Fe.
GN—Great Northern.
CB&Q—Chicago, Burlington & Quincy.

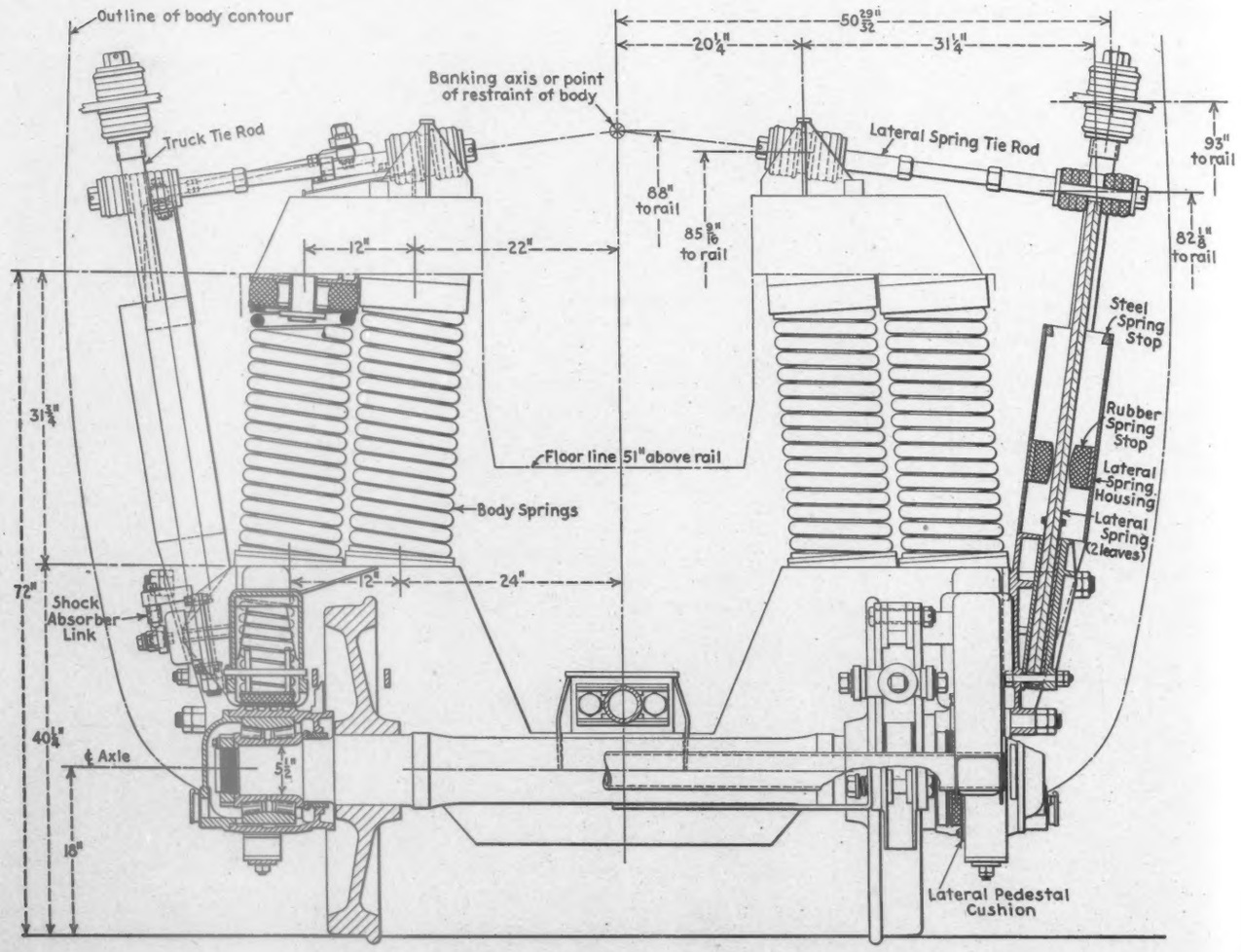
Electric power on the Santa Fe car is obtained from a Safety 10-kw. generator; body mounted on rubber insulators and driven by a flat belt from the truck axle. The Burlington car has a G. E. 20-kw. generator, driven by a Safety V-belt and gear drive. The generator is mounted longitudinally under the center sill in resilient mountings. The Great Northern car is similarly equipped with the exception of the generator which is a Safety

The upper end of the lateral swing controls over one of the trucks —A body support spring is reflected in mirror at right

ment to conform to that in general use on the owning road. The Santa Fe car has a Safety six-ton steam-ejector type air-cooling unit. The Burlington car is equipped with a Trane evaporative-condenser air-conditioning unit. A Frigidaire eight-ton air-conditioning unit is used on the Great Northern car. All three cars have overhead air distribution through Anemostats. Both floor and overhead heating is installed, with full thermostatic control.

Pendulum Cars Are Easy Riding

Demonstration runs indicate that the new pendulum cars are unusually quiet and that the riding qualities represent a distinct improvement over existing modern equipment. Although this type of car rides well when coupled to standard cars, the best riding qualities and full action of the pendulum suspension can be experienced only when the car is coupled between other cars of similar design. Since the banking of the pendulum car is opposite in direction to the roll of a standard



Partial cross-section of pendulum car through truck-spring support

20-kw. type. A Safety motor alternator, suspended beneath each car supplies 110-volt, a.c. current to the fluorescent lamps, razor and curling iron outlets.

Exide batteries are used in all three cars. D.c. charging receptacles are installed at each side of the cars and a.c. standby receptacles are available on the Burlington and Great Northern cars to permit operation of the air-conditioning equipment at stations and terminals.

Each of the three cars is air-conditioned with equip-

car there is more relative movement and greater forces acting at the diaphragm when the pendulum car is coupled to a standard car than when coupled between other pendulum cars. While these forces restrict the pendulum action and tend to introduce some shock and vibration into the car, the generally excellent riding qualities are apparent to passengers comparing this car with other cars, even when the car is coupled between standard cars.

Frederick W. Hankins, D. SC.

Bucknell University was proud last June to adopt him as one of her sons

"FROM your boyhood days in England, without formal scientific education you have mastered the complexities of one of the most exacting responsibilities in modern industrial science. Step by step you have advanced by the hard way to the very pinnacle in the field of transportation. Administrator of a vast organization of men and machines, you have mastered your responsibilities through a rare combination of brains and character and energy and faithfulness. Bucknell is proud to put its seal upon you and your career and to call you hereafter one of her own sons." Such is the citation that was given when the degree of Doctor of Science was conferred upon Fred W. Hankins, assistant vice-president (operation) of the Pennsylvania Railroad, by Bucknell University at its Commencement exercises, June 9, 1941.

The awarding of such high scholastic honors to a railway mechanical department officer is most unusual. It is quite as extraordinary, also, for a man who has not been college trained, to reach such an exalted official position on the Pennsylvania Railroad. More than that, Mr. Hankins did not come up through Altoona, that great and revered center of training for Pennsylvania Railroad mechanical officers; nor, in fact, did he even start his railroad career on the Pennsylvania Railroad.

Why was Fred Hankins so honored? What sort of man is he? What peculiar traits and abilities have been responsible for his advancement to so prominent a position of authority and responsibility?

This is the second of three sketches of railway mechanical department officers who have been signally honored by colleges or universities. All three of them were awarded doctor's degrees last June. This is a most unusual occurrence. Why were these men so honored? Last month we published a story about George McCormick, general superintendent motive power of the Southern Pacific, who was given the degree of doctor of engineering by the Texas Agricultural and Mechanical College. Next month we will present an article on K. F. Nystrom, mechanical assistant to the chief operating officer of the Chicago, Milwaukee, St. Paul & Pacific, upon whom the degree of doctor of engineering was bestowed by Marquette University. These three men have quite different backgrounds. The routes over which they advanced to eminence differed quite as radically. As outstanding leaders, however, it would seem that they must possess some basic common characteristics. The studies were not prepared with this thought in mind; they were, in fact, made quite independently and reflect the characters and accomplishments of these men as seen by those with whom they have been intimately associated. To this extent the writer has functioned more as a reporter than as an evaluator.

Born in London

First, let us sketch in his background and the high spots in his career. He was born in London, England, on New Year's Day, 1876. His family came to the United States when he was two and a half years old. His uncle, a roving sort of chap, had been attracted to Pennsylvania when oil was first discovered, and induced Fred's father to follow him to this country. The wells were not drilled deep during the early stages of oil field development and the supplies of oil near the surface were soon depleted. The developers would then move on to new areas. This was disturbing to family life; moreover, Fred's mother was taken quite ill and for a couple of years he was sent to live in a German family, which had a son of about his own age. His father after a few years decided to give up the oil business and return to his trade as a baker. He built a home in the nearby town of Foxburg, Pa., designing and utilizing the front portion of it for a bakery.

Starts to Work at Fifteen

Fred went to school until he was about 15 years old. For a while he worked in his father's bakery and then in October, 1890, started to serve an apprenticeship with Fink & Zahnizer at Washington, Pa. This company manufactured drilling tools, such as bits, augur stems, etc., and conducted a general foundry business. Several months later, April 1, 1891, he went to work as a machinist apprentice at Foxburg, Pa., for the Pittsburgh & Western (now B. & O.), at that time a narrow gage line. From April, 1894, to July, 1897, he worked as a machinist on the Baltimore & Ohio at Allegheny, Pa. He entered the service of the Allegheny Valley (now P. R. R.) at Pittsburgh as a machinist in July, 1897.

For a few months in 1901, March 1 to June 30, he was acting enginehouse foreman at East Brady, Pa. He returned to Pittsburgh as a machinist, but on September 29 resigned to enter the service of the Spang-Chalfant Company of Pittsburgh. At the end of the year, how-

Frederick William Hankins

ever, December 30, 1901, he re-entered the service of the Pennsylvania Railroad at Pittsburgh as a machinist. From February 1, 1902, to May 8, 1902, he was acting enginehouse foreman at Pittsburgh. On December 9, 1902, he was appointed a leading machinist, which position he held until April 21, 1905, when he was transferred to the Cumberland Valley Railroad as enginehouse foreman at Chambersburg, Pa. He was made a foreman January 10, 1907, general foreman, January 1, 1910, and on the first of May, 1916, was promoted to master mechanic.

Attracts Attention of J. T. Wallis

During the period of the Railroad Administration in the World War, Master Mechanic Hankins' jurisdiction covered sections of three other roads in his district (the Western Maryland, Reading and the Baltimore & Ohio), in order to take advantage of the shortest and most direct routings. In a way he reported to three bosses. Apparently he did such a good job that in some way it attracted the attention of J. T. Wallis, at that time general superintendent motive power of the Pennsylvania Railroad, with headquarters at Altoona, and in January, 1919, he was transferred from the Cumberland Valley to Altoona for special work on the planning and arrangement of proposed new shop facilities at Marietta, Pa. These shops were never built, but the study and experience gained by Mr. Hankins at that time proved most useful in later years. Except for the manufacturing balconies, the general plan was followed in the building of the new Juniata erecting-machine shop at Altoona Works.

In March, 1920, when the railroads ceased to operate under the United States Railroad Administration, Mr. Hankins was made assistant chief of motive power, Pennsylvania System, assuming supervision over the condition of power for the entire system. In May, 1923, he was made general superintendent motive power of the Pennsylvania's Central Region, with headquarters at Pittsburgh. That region had been reduced by strike conditions to a point of efficiency none too high. This gave him an opportunity to demonstrate his ability, not only to handle a large organization, but to organize large operations and at the same time to build them up with meticulous care as to detail. It proved to be a "shirt sleeve job" for a couple of years, but as one of his associates expresses it, "it enabled him to find himself."

He was therefore well prepared when in February, 1927, he was made chief of motive power of the Pennsylvania System, with headquarters at Philadelphia.

Shop Facilities Drastically Revised

While Mr. Hankins is modest and not given to boasting, one cannot but feel in chatting with him that he takes a justifiable pride in the program for revamping the repair shop facilities which was inaugurated when he became chief of motive power. This undoubtedly played a large part in enabling the mechanical department of that great system to so successfully weather the long years of depression. His thorough, practical experience, the shop studies he made under Mr. Wallis, his responsibility for motive power conditions over the entire system, and the difficulties which he had to overcome in the Central Region, gave him an excellent background of experience for tackling this difficult and rather stupendous problem.

When he took over the job of chief of motive power the class repair work on steam locomotives was handled in ten shops, of which only two were modern and capable of handling economically the heavy steam power which had become a large part of the locomotive ownership at that time. His experience as general superintendent of motive power made him realize the difficulty of attempting to maintain heavy power in the smaller types of shops, and he therefore concentrated on four general aims:

1. To concentrate the locomotive repair work in large shops properly fitted to handle it.
2. To eliminate the small shops not properly equipped to take care of the big power.
3. To see that the shops retained were fitted with the necessary tools and equipment.
4. To provide the proper quality of supervision and craftsmanship at these shops, to insure that first-class work was done.

This was not an easy task; it required several years to accomplish it, and required much tact, judgment and knowledge both of shop location and equipment and of the operating personnel. It was undertaken during a period of very heavy business, but was completed in time to meet the conditions when the drop in business during the depression made it most essential that the locomotive equipment should be maintained in good condition by qualified personnel at the fewest number of places.

When the program was completed, the locomotive class repair work was concentrated in three modern shops properly equipped, instead of at ten shops of which only the larger were able to handle the heavy modern power.

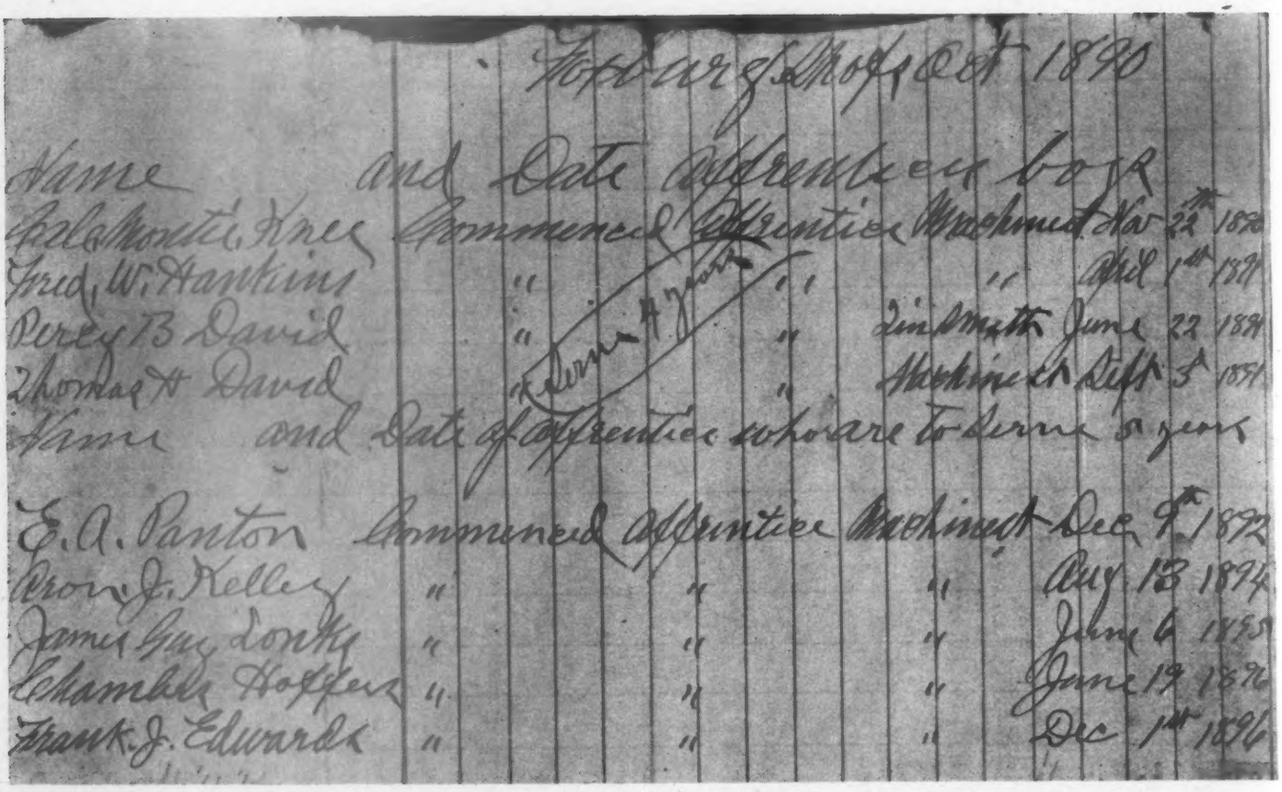
While Mr. Hankins was working on the co-ordination of the shop facilities to concentrate the locomotive class repair maintenance, he was carrying out a similar program in connection with class repair of passenger and freight cars. The points at which car work was done were reduced from 25 to 9, and this was largely accomplished through the fitting of these nine points with suitable equipment and personnel to do the repairs on a processing basis, thus increasing their efficiency and the volume of work that could be handled.

It should also be noted that as cars were run through these shops for class repairs they were thoroughly modernized.

Responsibilities Broadened

Titles are sometimes confusing when one attempts to trace the advancement or development of a railway officer. Reading between the lines, however, it is apparent that when Mr. Hankins assumed the position of general superintendent of motive power at Pittsburgh, he became a member of the regional cabinet, so to speak, and not only headed up the mechanical department of the region, but became deeply interested in and had a part in the total operations of the region, and particularly in relation to the selection and development of personnel. Certainly when he became chief of motive power of the entire system he must have become an important member of the inner council, else he might not have had the support that was required to bring about so radical a reorganization of the equipment maintenance facilities. This is evidenced to a degree, also, by the fact that in addition to his title of chief of motive power, he was appointed assistant vice-president in charge of operation on January 1, 1931. The title was changed to chief of motive power in June, 1932, but on January 1, 1936, he was appointed assistant vice-president—chief of motive power. On February 1, 1941, his title was changed to assistant vice-president (operation).

It will be recalled that it was during his administration that the eastern lines of the railroad were electrified and his general guidance and direction had much to do



Foxburg Shops Oct 1890

Name and Date Apprentices Commenced Apprentice Machinist Mar 22 1892
Fred W. Hankins " " " April 1st 1889
Percy B. David " " Die Smith June 22 1891
Thomas H. David " " Machinist Sept 5 1891
Name and Date of Apprentice who are to serve 3 years
E. A. Panton Commenced Apprentice Machinist Dec 9th 1892
Peter J. Kelley " " " Aug 13 1894
James Guy Conley " " " June 6 1895
Chamble Hoffer " " " June 19 1896
Frank J. Edwards " " " Dec 1st 1896

Part of a page of an old apprentice record book of the Pittsburg & Western at the Foxburg, Pa., shops—Mr. Hankins' name is second from the top—Page rescued as the records were being burned

with the completion of the electrification program on schedule. In more recent years, also, with broader responsibiities in the operating department, he has had much to do with general transportation matters. He is credited with having performed an outstanding job during the great floods in Pennsylvania in 1936, in organizing men and materials at strategic points and assisting in the restoration of the service through the flooded areas in record-breaking time.

Related Activities

Naturally Mr. Hankins has taken a keen interest in the activities of the Mechanical Division of the Association of American Railroads. He has been a member of the General Committee of that Division for many years and served as its chairman, 1938-40. He was a delegate to the International Railway Congress at Madrid, Spain, in May, 1930.

In 1934 he was appointed by Joseph B. Eastman, at that time Federal Co-ordinator of Transportation, as a member of a committee to study and report on the mechanical problems affecting the railroads. This committee presented a thorough and voluminous report in December, 1935. It reviewed railway equipment and methods, and practices and standards relating thereto, from both an historical and a technical standpoint. As Mr. Eastman pointed out, "It contains a wealth of data which should prove of much value in current operations. In many instances it indicates strongly the necessity for continued investigation, and in certain specific fields it directly recommends such an investigation." One who was associated with Mr. Hankins on this project and also in the development of the standardization of freight car design, remarks that "a lasting debt is due to the fearless manner in which he at all times demanded that a definite decision be reached on every controversial question."

Mr. Hankins, in addition to his railroad duties, is now serving as vice-chairman, Advisory Committee, Division of Contract Distribution, Office of Production Management, for the State of Pennsylvania. This district has made an unusually good record and is said to be setting a pace in the effort to utilize small manufacturers and sub-contractors, in order to secure maximum production in the present emergency.

The Man Himself

So much for the route over which he has traveled and some of his broader accomplishments. How about the man himself? What follows is gleaned from or is a composite of expressions of a number of men who have been intimately associated with him, either in the official family of the railroad, or as representatives of government bureaus, labor and the railway supply industry.

First of all, he is distinguished by his sound common sense. A shrewd observer, of judicial temperament and an excellent judge of men, sizes him up in these words: "The outstanding characteristic in Fred Hankins, over and above his keen sense of humor, is a kindly, old-fashioned horse sense, which is almost a lost art nowadays, coupled with the greatest versatility. He reminds me whenever I am with him of David Harum." A fellow railroad officer points out that, "his power of analysis is very keen. He can almost instinctively make a correct estimate of a situation by his own observation and questioning, and come to a sound conclusion without being influenced by extraneous related facts and opinions. He has the most *uncommon amount of common sense* that you can generally find in a person."

An operating officer who has long been associated with Mr. Hankins emphasizes this same talent in a somewhat different way and in greater detail. "Perhaps," he says, "his most marked characteristic is an almost uncanny ability when attacking a job, to cut

through quickly to the heart of a matter, size up the essential element for sharp definition, and carry the work rapidly through to completion. His mind is never deterred or diverted from the main issue and he keeps at his task with tenacity and determination until it is a finished and well rounded achievement, complete in all its parts. He possesses to an unusual degree the attribute of good common, horse sense, and applies it with firm decision and dispatch. He is cool in action, adept in organization and administration, and gets things done. He is possessed of much creative and imaginative power, combined with the faculty for translating his thoughts and plans into prompt and decisive action."

A railroad executive in these days is called upon to make many investigations, including those of a highly controversial nature. One who has watched and studied him critically upon such occasions points out that, "when a case in which he is participating is under consideration he insists that all available facts be promptly assembled. When fully informed he decides without delay, yet I have never known him to withhold essential information or to take an unfair advantage of a colleague who might be in possession of less information, or has not had so much experience. When he makes up his mind he has positive views, which cannot easily be mistaken. He may be wrong, but I have never known him to be in doubt. He has the courage of his convictions. He stands by his guns. He does not let high powered salesmanship or politics influence his judgment."

Dealing with Highly Technical Matters

While Mr. Hankins did not attend school after he was 15 years of age and lacks a college technical training, his ability in handling engineering problems is highly regarded by engineers. He is a good picker of men and undoubtedly has the ability to seek out and enlist the best engineering advice. This is emphasized by a fellow officer of the railroad, who has had an excellent technical training and background, in these words: "He has the definite trait of being able to select as his officers those whose judgment is sound from a practical viewpoint on whatever technical subject he may be reviewing, to the end that when he comes to his own determination he has obtained a fair technical knowledge of the situation through his officers. This necessarily eliminates any tendencies to ride hobbies on any particular subject."

A man well known because of his outstanding ability as a mechanical engineer, and who has been thrown into rather intimate contact with Mr. Hankins over a score of years, states that, "Running through all his activities there is a noticeable order and precision. In matters of importance it is his method to listen to all sides and lead everyone to a logical, practical working agreement, maintaining the principle of progress and advancement at all times."

One of his associates on the railroad, a technically trained man, suggests that he has "a very thorough grasp of the fundamentals of engineering problems and has contributed considerable original thought on these subjects."

Builder of Men

Possibly the reader may already have gathered, reading between the lines, so to speak, that Fred Hankins to an outstanding extent, understands and knows how to deal with human nature. It is not altogether unlikely that this trait may have been developed, or at least greatly strengthened, by the fact that he was thrown so largely on his own resources in his boyhood days. Because of this ability he has for a long time been a considerable factor in selecting the official personnel on

Group from the Allegheny, Pa., roundhouse 1897—Mr. Hankins is center man in lower row

President Arnaud C. Marts of Bucknell University conferring the degree of Doctor of Science upon Frederick William Hankins—George T. Ladd of Pittsburgh, who presented Mr. Hankins for the degree, is in the background

the Pennsylvania. "A man without prejudice," says a P. R. R. executive, "he looks for the ability and the good in anyone and tries to develop the man. He is equally courageous in being able to tell a man, when he has gotten into a position beyond his capacity, that he should hunt something within his capacity and so find greater happiness."

Mr. Hankins has always taken a keen interest in the selection and training of the younger men, following them through the years, and counseling with them when they have had difficulties or needed advice. He has not hesitated to talk with them straight-from-the-shoulder, if that sort of approach seemed necessary. As one of his associates puts it, "I have known no one more able to give a man hell, make him like it, and profit by it."

He has recognized the importance of developing well qualified, all-around mechanics and to this end has used his influence to see that the apprentices were moved from job to job, according to schedule. Special apprentices have profited from the fact that he has given them every opportunity to secure a broad experience and to prevent them from getting into routine work and blind alleys. It is doubtful if the men themselves have got any more satisfaction out of their advancement or promotion than has Mr. Hankins. In a real way he has been a "builder of men."

One of his associates sums up this special ability thus: "One of Mr. Hankins' outstanding characteristics is his keen sense of human values. He can quickly appraise men, is equally capable in directing their efforts, inspiring them to do their best, and in applying discipline when necessary, at the same time retaining their loyalty and affection. I am confident that one of the greatest satisfactions of his railroad career has been his intense interest in developing men, determining by careful observation the work for which they are best fitted and guiding them to jobs in which their talents and abilities find full expression."

In the training of men under him he is most helpful in giving them direction and help where help is needed. There is a story that an important staff officer came into his office one day and said he was terribly worried about a certain matter. Mr. Hankins immediately replied, "That will be all right, I will do the worrying and you do the work; as a matter of fact, I have just organized a Worry Department and I am referring all worries to them, and at the present time they are not busy and can take on your troubles." This casual remark spread to a good many in his organization and relieved them of wasting their time worrying about things not essential.

His fairness to others, who may in his judgment be treated unfairly, is well recognized and, conversely, his uncanny ability to detect delinquencies and failures in others has been the cause of correcting conditions in personnel or management which have led to his success.

A Disciplinarian

Mr. Hankins has the reputation of being a strict disciplinarian. But, on the other hand, an operating officer who has been closely associated with him, says: "I defy any man to travel the length of this railroad and find one individual who is not working every day for him, regardless of the fact that he is strict; and regardless of the number of hours it takes they are glad for the opportunity of doing the job well for one who is held in the highest esteem, from the fellow who pushes a wheelbarrow to the highest boss in the shop."

He has a keen sense of humor and it is said that he has the happy faculty of making people feel comfortable, even though he may be applying very strict discipline; or uncomfortable, as the necessity may warrant.

Ability to Adjust Himself

Reports one of Mr. Hankins' friends: "When he went to the Cumberland Valley, he made himself one of the people there. It is a land of homes; and he owned homes. It is a land of orchards, both apple and peach; and with his friends of the Valley he developed orchards,

"Doctor Hankins"

both apple and peach. He became a part of the community.

"When he was raised to high position he adjusted himself in his contacts to the business men with whom he had to associate, and he became popular with all of those with whom he associated. In business he has the happy faculty of adjusting himself to other men's viewpoints."

Loyalty to Friends

"He is remarkable," reports an associate, "for his ability to retain old friendships as he advances through the railroad organization; it makes little difference to him whether a man is a car inspector or a vice-president; if he knows, or has known him, he likes him as much as a friend, no matter what his position, and this characteristic has enabled him to retain the respect and friendship of all classes of people, as he himself has advanced in position and responsibility."

"He is still as easy to approach as the humblest roundhouse foreman on the railroad," suggests one of his friends. "As an instance of this, shortly after he was promoted to chief of motive power he was making an inspection in a large locomotive repair shop, accompanied by the shop superintendent and other local officials. While passing a locomotive on which the boiler was stripped and being repaired, a workman saluted him from above, calling, 'Hello, Fred.' Mr. Hankins stopped and looked up at the boiler; he did not immediately recognize the workman, but called him to come down to the floor. 'I am so and so, I worked for you as a boilermaker years ago,' said the workman. This was sufficient to refresh Fred's mind; he grasped the greasy hand of the workman and gave him a very cordial handshake."

His Hobbies

There is no question about Fred Hankins' hobbies, although one of them is part of his vocation. We have already commented upon his interest in "building men." Ever since he achieved a supervisory position he has been a hunter for promising material and then in testing it out. He has tried to discover and inspire men who otherwise might go through life without having their abilities recognized and utilized. More and more he has been impressed by the fact that in a large organization someone must take the trouble of picking out, testing out and following through with promising material. It is a large task; it necessitates adequate personnel records and check-ups, and an intimate contact with and knowledge of the men on the job. It can't be done by sitting in a swivel chair at headquarters.

His other hobby is fishing. One of his cronies comments thus: "Fred Hankins is a great fisherman, who would and does ride 200 miles at night to grab a few trout and bass out of a stream the next morning, and then start back at noon. He has more fishing paraphernalia than any two men ought to have, but professes to have it because his friends, who know so much less about fishing, would be 'hamstrung' if he did not have the wherewithal."

Mr. Hankins is a member of the Masonic Lodges and of the Episcopal Church. At the annual meeting of the Alpha Phi Chapter of Kappa Sigma Fraternity, held at Bucknell University last June, he was elected an honorary member of the Chapter.

In Conclusion

The Pennsylvania Railroad, possibly more than any other American railroad, has had the reputation of being officered by technically trained men. A mechanical department officer, a graduate of Yale and trained at Altoona, became one of its outstanding presidents; moreover, that president, William Wallace Atterbury, served with distinction during the First World War as director-general of transportation of the A. E. F. and was commissioned a brigadier general.

Fred Hankins, with hardly a common school education, has achieved a high official position on that system, coming up through the mechanical department—a highly technical branch of the service.

Until the early part of the present century an engineer was defined as one who was expert in dealing with and utilizing materials and forces of nature. Then came Fred Taylor and the so-called scientific management experts. They pioneered the way in emphasizing the importance of the human factor in engineering and industrial operations, and the definition of the engineer was broadened to include responsibility for utilizing and directing of the human element in industry.

In Fred Hankins we have an example of a man who has an unusual understanding and appreciation of the importance of the human element in railroad operations. Handicapped by a lack of a college technical education he may possibly have been, but few college trained men have achieved so great a success in the railroad mechanical department. His natural ability to get along with people, plus his keen observation and thorough practical experience, has made it possible for him to select and train men, college educated and otherwise, and to utilize them effectively in the administration of a great technical organization. His success emphasizes the vital importance of mechanical department officers studying to improve their ability to deal with and wisely direct the human element in their organizations.

Bird's-eye view of a portion of the Altoona Works of the Pennsylvania

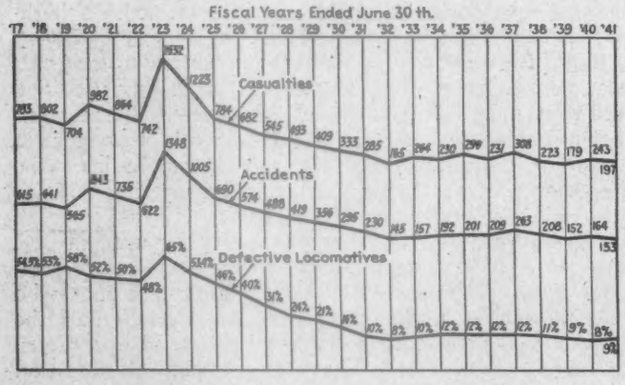
Bureau Annual Report Shows That

Locomotive Defects Increase

The number of accidents, persons killed and injured shows substantial decrease—Director Hall cautions against danger and waste from temporary repairs

THERE were 153 accidents in connection with steam locomotives, resulting in 15 deaths and 182 injuries during the fiscal year ended June 30, 1941, according to the annual report of John M. Hall, director, Bureau of Locomotive Inspection, Interstate Commerce Commission. This represents a decrease from the preceding year of 11 accidents, of 3 in the number of persons killed, and of 43 in the number of persons injured. The tables show that 9 per cent of the locomotives inspected were found defective, an increase of 1 per cent; that the number of locomotives ordered withheld from service because of defects that rendered the locomotives immediately unsafe increased by 15 per cent. There was also an increase of 15 per cent in the total number of defects.

Of the total of 153 accidents, 43 were caused by the failure of some part or appurtenance of the steam locomotive boiler, resulting in the loss of 12 lives and injuries to 64 persons. This is a distinct improvement over 1940 when there were 67 accidents related to steam



Relation between defective steam locomotives, accidents and casualties resulting from locomotive failures during 25 years

locomotive boiler failures which caused the loss of 16 lives and injuries to 110 persons.

In a table showing the various parts and appurtenances of steam locomotives and tenders, failures of which have caused serious or fatal accidents, failures of nine groups other than crown-sheet failures are each the cause of five or more injuries. In the order of the number of casualties, these are: reverse gears; handholds; fire doors, levers, etc.; springs and spring rigging; brakes and brake rigging; flues; boiler checks; throttle rigging, and trucks, leading, trailer or tender. Only two groups have shown a consistently bad record throughout the five years covered in the table. These are reverse gears, with 11 accidents and 12 injuries in 1941, and handholds, with 11 accidents and 11 injuries during the same year.

Tables in the report also record 11 accidents caused by failure of some part or appurtenance of locomotives other than steam, in which 11 persons were injured, five of whom were firemen, two maintenance employees and one each of the following: engineman, brakeman, conductor and nonemployee. Four of the 11 casualties were the result of fires due to overflowing or leakage of fuel, crank-case explosions, back firing, etc. The other casualties were from a variety of causes.

The report includes in tabular form a complete analysis of the number of locomotives inspected, the defects found, and the number ordered from service on each railroad. Tables showing the summaries of the number of defects found on all of the railroads are here shown.

Explosions and Other Boiler Accidents

All of the 11 explosions that occurred in the fiscal year, in which 11 persons were killed and 29 injured, were caused by overheating of the crown sheets due to low water. There was a reduction of one in the number of persons killed and an increase of 14 in the number of persons injured from this cause as compared with 1940.

Four of the explosions were particularly violent; one

Number of Casualties Classified According to Occupation—Steam Locomotive Accidents

	Year ended June 30											
	1941		1940		1939		1938		1937		1936	
	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured
Members of train crews:												
Engineers	5	41	5	70	4	46	3	70	8	106	4	75
Firemen	5	68	6	49	6	66	2	80	5	78	6	72
Brakemen	3	21	4	24	2	18	..	31	3	30	3	28
Conductors	..	8	1	4	..	5	..	6	1	18	..	13
Switchmen	..	6	..	4	..	6	..	7	..	10	..	2
Roundhouse and shop employees:												
Boilermakers	..	..	1	3	1	1	..	2	2	2	..	..
Machinists	1	3	..	3	..	2	..	..	..	2	..	4
Foremen	..	2	..	..	..	..	..	1	..	..	..	3
Inspectors	..	..	..	..	..	..	..	1	..	..	..	2
Watchmen	1	2	..	1	..	1	2	..	1	1	1	1
Boiler washers	..	..	..	..	..	..	..	1	..	..	..	..
Hostlers	..	3	..	2	..	1	..	6	..	9	..	3
Other roundhouse and shop employees	..	1	..	1	..	2	..	1	..	3	..	3
Other employees	..	9	1	20	..	2	..	3	1	14	..	5
Nonemployees	..	18	..	44	2	14	..	7	4	10	2	4
Total	15	182	18	225	15	164	7	216	25	283	16	215

of these accidents occurred while the locomotive was hauling a passenger train at an estimated speed of 50 to 55 m.p.h. Two employees were killed and one employee and five Pullman employees were injured. The force of the explosion tore the boiler from the running gear and hurled it forward 330 ft. where it struck the track, rebounded and again struck the track and came to rest on its right side, in reverse position, near the east side of the track. The running gear, tender, and first four cars were derailed where the boiler first struck, and the track was torn up from this point for a distance of 350 ft. Parts of the wreckage were scattered in various directions up to 725 ft. from the point of explosion.

In another accident, in which no fatalities occurred but in which 10 employees and three nonemployees were injured, the explosion occurred about 38 minutes after arrival at a station while the locomotive and empty passenger train were being moved, together with another locomotive and its empty passenger train, from the final terminal station for the passenger train to the yard and enginehouse. The force of the explosion tore the boiler from the running gear and hurled it upward and partly over the other locomotive to which it was coupled. In its descent the boiler struck the back edge of the cab of the other locomotive and landed on top of the tender and a baggage car immediately to the rear, then rolled to the ground and came to rest upside down on the adjacent tracks about 154 ft. from the point of explosion.

Three employees were killed in another explosion while the locomotive was hauling a freight train at an

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Figs. 1 and 4—The results of an explosion caused by overheated crown sheet due to low water in which four employees were killed and one was injured—Parts of the firebox wrapper sheets and stays, weighing between 14,000 and 16,000 lb., are shown in Fig. 4—The remainder of the firebox and boiler are shown in Fig. 1

Figs. 2 and 3—The result of a broken side rod which failed while the locomotive was hauling a passenger train at an estimated speed of 60 m. p. h.—The rod punctured the outside and inside throat sheets and steam and hot water escaped around and into the cab—Two employees were killed

estimated speed of 8 m.p.h. The force of the explosion tore the firebox casing sheets and mud ring, together with stays, braces, and various appurtenances, from the cyindrical part of the boiler. These parts were hurled forward 347 ft. and came to rest on the track, where they were struck by the front or low-pressure engine which had become separated from the rear frame due to breakage of the articulating casting. The cylindrical part of the boiler was torn from the rear engine, the running gear of which stopped 72 ft. from the point of explosion. This part of the boiler, with torn firebox sheets attached to the inside throat sheet, was hurled forward 196 ft., where it alighted on the track, then skidded and came to rest on the north side of the track, 235 ft. from the point of explosion, with attached parts of the firebox sheets extending across the track.

In another explosion, in which four employees were killed and one nonemployee was injured, the force of the explosion tore the boiler from the running gear and it alighted on the outer rail of an adjacent siding, then rolled to the left and came to rest in an upright position 107 ft. ahead and 40 ft. to the left of the point of explosion. Parts of the back end or firebox casing sheets were blown off, and the part of the crown sheet to the rear of the combustion chamber, with the entire right firebox side sheet, a major portion of the left side sheet, and two small portions of the door sheet were blown out and ahead 491 ft. and came to rest on the main track, where these parts were struck by the running gear. Parts of the wreckage were blown for distances up to 562 ft. from the point of explosion.

Two employees were killed and nine employees were injured in the remaining seven accidents in which the explosions were less violent than those described.

Boiler and appurtenance accidents other than explosions resulted in the death of 1 person and injuries to 35 persons; this is a reduction of 3 deaths and 60 injuries as compared with the preceding year.

Boiler-Feeding and Water-Level-Indicating Devices

Our investigations of two of the explosions revealed serious neglect in not maintaining the boiler-feeding devices in condition to perform their intended function. Repeated reports of impairment of capacity of these devices had been made over considerable periods of time prior to the explosions. All of these reports were signed for purporting to show that work had been done on the parts reported but later reports showed that the defective conditions continued until the explosions occurred. Repeated reports on the same defective condition should be sufficient warning that proper repairs had not been made and demonstrate the necessity of making such inspections and tests after repairs have been attempted, that will show whether their purpose has been accomplished.

Serious neglect is also evident in some instances in the matter of maintaining water-level-indicating devices in good condition, which includes thorough cleaning of gage cocks, water glass cocks, and water-column connections each time the boilers are washed, or more frequently if needed to prevent stoppages or partial stoppages of the water and steam passages, inspections and repairs sufficiently often and thorough to insure that these devices operate and indicate as intended, and the condition and proper placement of water glass lamps.

Extension of Time for Removal of Flues

One thousand one hundred and eighty-two applications were filed for extensions of time for removal of flues, as provided in rule 10. Our investigations disclosed that in 98 of these cases the condition of the locomotives was such that extensions could not properly be granted. Nineteen were in such condition that

Fig. 5—The running gear and tender after the boiler explosion shown in Figs. 1 and 4—The front driving wheel of the rear unit of the 4-8-8-2 type cab-ahead locomotive is resting on part of the crown sheet which came to rest on the track 491 ft. in front of the point of explosion

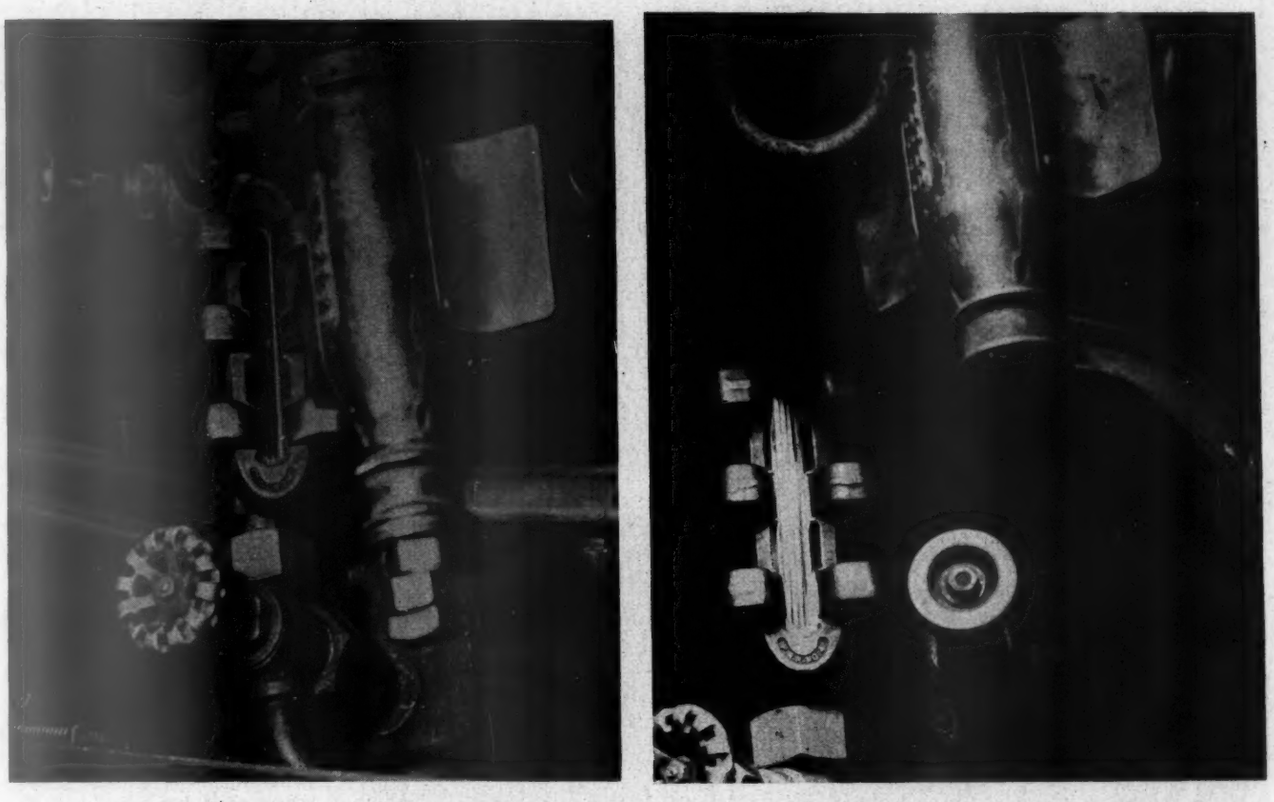


Fig. 6—A reflex type water gage (left) illuminated from the lamp in the cage has the appearance of carrying a full glass of water—After the light source was adjusted (right) the absence of water in the gage is clearly shown—The report carries the following comment:

If crown-sheet accidents due to misreading of the water level are to be avoided, it is necessary that proper attention be given to the lighting of water gages, the condition of the corrugations in reflex glasses, cleanliness of water glasses, and the condition of water and steam passages in water gages and connections, including water columns.

the full extensions requested could not be authorized, but extensions for shorter periods of time were allowed. Seventy-two extensions were granted after defects disclosed by our investigations were required to be repaired. Twenty-nine applications were canceled for various reasons; 964 were granted for the full period.

Number of Steam Locomotives Reported, Inspected, Found Defective, and Ordered from Service

Parts defective, inoperative or missing, or in violation of rules	Year ended June 30					
	1941	1940	1939	1938	1937	1936
Air compressors	684	567	518	689	766	740
Arch tubes	31	20	28	66	105	74
Ashpans and mechanism	67	37	67	72	80	79
Axles	5	3	2	13	10	13
Blow-off cocks	205	191	204	226	199	236
Boiler checks	313	288	279	301	382	356
Boiler shell	271	266	272	331	347	383
Brake equipment	1,945	1,506	1,577	2,044	2,322	2,480
Cabs, cab windows, and curtains	1,087	1,078	943	1,226	1,807	1,638
Cab aprons and decks	307	277	260	326	466	450
Cab cards	97	101	92	109	145	166
Coupling and uncoupling devices	74	53	60	73	74	65
Crossheads, guides, pistons, and piston rods	858	815	739	905	1,160	1,056
Crown bolts	97	54	47	59	76	63
Cylinders, saddles, and steam chests	1,332	1,320	1,232	1,645	2,206	1,717
Cylinder cocks and rigging	438	447	418	585	729	605
Domes and dome caps	94	78	90	109	101	114
Draft gear	620	508	450	740	522	513
Draw gear	347	306	360	479	560	451
Driving boxes, shoes, wedges, pedestals, and braces	1,348	1,243	1,330	1,688	1,637	1,712
Firebox sheets	224	191	238	244	371	295
Flues	150	147	165	159	225	178
Frames, tail pieces, and braces, locomotive	863	665	708	1,001	1,053	997
Frames, tender	83	78	71	131	120	113
Gages and gage fittings, air	183	132	155	230	261	257
Gages and gage fittings, steam	236	211	226	279	324	350
Gage cocks	373	400	361	451	538	579
Grate shakers and fire doors	430	273	252	403	470	400
Handholds	433	333	349	405	510	502
Injectors, inoperative	39	30	26	26	38	40
Injectors and connections	1,882	1,330	1,457	1,784	2,020	2,085
Inspections and tests not made as required	7,215	6,218	6,645	8,204	9,638	9,005
Lateral motion	357	313	243	325	446	404
Lights, cab and classification	50	49	50	48	90	78
Lights, headlight	190	180	177	257	313	251
Lubricators and shields	196	185	200	212	254	255
Mud rings	187	213	248	203	272	237
Packing nuts	508	418	408	448	487	508
Packing, piston rod and valve stem	675	660	739	913	1,393	1,133
Pilots and pilot beams	142	140	104	154	133	178
Plugs and studs	156	156	179	238	238	236
Reversing gear	387	320	317	404	492	463
Rods, main and side, crank pins, and collars	1,565	1,199	1,293	1,669	2,348	2,093
Safety valves	68	61	97	125	132	125
Sanders	490	415	432	536	655	678
Springs and spring rigging	2,597	2,174	2,340	2,901	3,172	3,008
Squirt hose	62	50	75	94	133	134
Stay bolts	239	227	181	211	276	279
Stay bolts, broken	198	271	258	380	542	520
Steam pipes	385	255	285	410	446	526
Steam valves	110	106	115	141	165	227
Steps	555	449	490	631	678	615
Tanks and tank valves	952	768	837	955	1,009	877
Telltale holes	59	95	58	67	79	127
Throttle and throttle rigging	688	647	638	685	909	760
Trucks, engine and trailing	636	598	628	762	785	861
Trucks, tender	773	705	665	907	1,018	1,108
Valve motion	580	506	554	722	798	824
Washout plugs	445	478	487	626	598	714
Train-control equipment	1	2	5	11	12	6
Water glasses, fittings, and shields	788	753	690	915	1,049	1,118
Wheels	536	554	466	577	803	790
Miscellaneous—Signal appliances, badge plates, brakes (hand)	785	564	610	684	759	608
Total number of defects	37,691	32,677	33,490	42,214	49,746	47,453
Locomotives reported	43,236	44,274	45,965	47,397	48,025	49,322
Locomotives inspected	105,675	102,164	103,606	105,186	100,033	97,329
Locomotives defective	9,570	8,565	9,099	11,050	12,402	11,526
Percentage inspected found defective	9	8	9	11	12	12
Locomotives ordered out of service	560	487	468	679	934	852

Locomotives Propelled by Power Other Than Steam

There was an increase of four in the number of accidents occurring in connection with locomotives other than steam and an increase of four in the number of persons injured as compared with the preceding year. No deaths occurred in either year.

During the year six per cent of the locomotives inspected by our inspectors were found with defects or errors in inspection that should have been corrected before the locomotives were put into use; this percentage is the same as in the preceding year. There was an increase of five in the number of locomotives ordered withheld from service because of defects that rendered the locomotives immediately unsafe.

Specification Cards and Alteration Reports

Under rule 54 of the Rules and Instructions for Inspection and Testing of Steam Locomotives, 225 specification cards and 6,786 alteration reports were filed, checked and analyzed. Corrective measures were taken with respect to numerous discrepancies found.

Under rules 328 and 329 of the Rules and Instructions for Inspection and Testing of Locomotives Other Than Steam, 447 specifications and 39 alteration reports were filed for locomotive units and 100 specifications and 91 alteration reports were filed for boilers mounted on locomotives other than steam. These were checked and analyzed and corrective measures were taken with respect to discrepancies found.

Legal Action

Based upon investigations made by the Bureau, one case of violation of the rules and instructions for inspection and testing of steam locomotives and tenders and their appurtenances, comprising 17 counts, was transmitted to a United States attorney for prosecution. This case is now pending in the district court.

No formal appeal by any carrier was taken from the decisions of any inspector during the year.

Locomotives and Accident Prevention

Vast strides have been made in improving the general condition of locomotives since 1924 due to increased funds available to the Bureau and a realization on the part of the railroads that more effective use can be made of locomotives maintained in condition to comply with the established rules and instructions. The percentage of locomotives found defective in the fiscal year ended June 30, 1940, reached a low of 8 per cent, and this percentage increased to 9 per cent in the fiscal year ended June 30, 1941. This represents one per cent recession in the condition in the fiscal year ended June 30, 1941, as compared with the preceding year. There was a material increase in the total number of defects found and reported by our inspectors as compared with the preceding year, and there was an increase of 15 per cent in the number of steam locomotives ordered from service.

Under ordinary conditions these results need not necessarily be particularly alarming since some variations can be expected from year to year; however, under present circumstances special significance is necessarily attached thereto because of the shortage of material and skilled labor. All possible measures should be taken to increase the thoroughness of inspections and to apply timely and substantial repairs.

The practice, still too often indulged in, of applying temporary repairs in the hope that the locomotive will make a successful trip and that more adequate repairs may be applied thereafter when the time is most convenient, has been productive of many failures on the line

Fig. 7—Injector steam-valve body and bonnet which blew out without warning, resulting in injury to one employee—The threads on the bonnet, applied the day before the accident, were found to be worn off about 1/32 in. and the fit in the valve body was enlarged, the threads apparently not engaging to any extent—When inverted, the bonnet would drop out

Number of Locomotives Other Than Steam Reported, Inspected, Found Defective, and Ordered from Service

Parts defective, inoperative or missing, or in violation of rules	Year ended June 30					
	1941	1940	1939	1938	1937	1936
Air compressors	22	8	14	6	6	2
Axles, truck and driving	5	..	1	5	4	6
Batteries	6	1	1	1	4	..
Boilers	4	10	6	6	5	5
Brake equipment	69	50	50	74	97	66
Cabs and cab windows	45	22	36	25	51	30
Cab cards	24	13	18	11	25	..
Cab floors, aprons, and deck plates	14	17	13	8	17	10
Controllers, relays, circuit breakers, magnet valves, and switch groups	7	16	13	7	8	..
Coupling and uncoupling devices	2	6	4	4	3	..
Current-collecting apparatus	3	1	5	8	4	16
Draft gear	15	31	17	23	28	24
Draw gear	3	2	4	3	1	1
Driving boxes, shoes, and wedges	36	29	52	16	14	5
Frames or frame braces	1	12	9	37	5	15
Fuel system	62	51	35	47	152	44
Gages or fittings, air	3	1	6	11	1	6
Gages or fittings, steam	..	2	..	..	..	..
Gears and pinions	2	1	2	2	2	..
Handholds	12	6	8	13	11	8
Inspections and tests not made as required	243	207	185	204	237	186
Insulation and safety devices	4	2	4	13	13	20
Internal-combustion engine defects, parts and appliances	54	35	32	26	50	23
Jack shafts	3	7	6	1	..	1
Jumpers and cable connectors	..	..	1	1	2	..
Lateral motion, wheels	4	5	1	..	1	2
Lights, cab and classification	2	1	3	2	5	6
Lights, headlight	1	3	4	4	11	4
Meters, volt and ampere	..	4	2	2	1	2
Motors and generators	16	12	19	18	10	14
Pilots and pilot beams	12	10	6	1	7	6
Plugs and studs	..	..	..	..	1	..
Quills	..	4	7	6	3	..
Rods, main, side, and drive shafts	4	2	2	2	23	2
Sanders	56	34	28	37	52	25

Springs and spring rigging, driving and truck	58	50	16	43	36	29
Steam pipes	1	4	..	5	1	2
Steps, footboards, etc.	35	22	18	23	13	..
Switches, hand-operated, and fuses	2	3	5	7	2	2
Transformers, resistors, and rheostats	3	1	1	3	..	..
Trucks	30	43	33	40	41	42
Water tanks	1	..	1	..	1	..
Water glasses, fittings, and shields	1	1	1	3	..	4
Warning signal appliances	4	..	1	3	2	1
Wheels	28	22	16	11	21	26
Miscellaneous	8	15	10	7	20	39
Total number of defects	905	766	696	769	991	674
Locomotive units reported	3,389	2,987	2,716	2,555	2,416	2,361
Locomotive units inspected	5,558	4,974	4,581	4,024	3,615	3,118
Locomotive units defective	319	298	260	274	328	252
Percentage inspected found defective	6	6	6	7	9	8
Locomotive units ordered out of service	21	16	14	9	24	11

of road; these failures, in addition to increasing the peril to life and limb of employees and others and increasing the ultimate cost of repairs, result in delay to the train involved and frequently affect the orderly movement of other trains. Avoidance of failures of locomotives on the line of road is an essential component of satisfactory railroad performance and it is therefore essential that the practice of applying temporary repairs of the character indicated be reduced to the absolute minimum.

Before a locomotive is started on any trip it should be known that all parts and appurtenances are in safe and suitable condition for service rather than to assume, as is sometimes done, that if the locomotive arrived under its own power it can go out again. All parts to which repairs have been made, the condition or capacity of which may not be determinable by visual inspection, such as air compressors, injectors, and feed-water pumps, should be appropriately tested for the output required under service conditions in addition to the usual examinations made when a locomotive is being prepared for service, since mere observation that these parts "work" when a locomotive is at the terminal is not sufficient to determine whether or not their capacity has been restored. In investigations of accidents we sometimes find reports on the defect that caused the accident repeated many times until failure eventually occurred, together with signatures on the reports indicating that the reported work had been done, or at least that repairs to the reported defects had been attempted each time a report was made. This is proof that safe repairs required on the locomotive had not been made and that labor had been wasted.

Fig. 8—A crack through the tire of an engine-truck wheel caused by application of fusion welding to build up the worn flange—Failure occurred after welding before the locomotive was placed in service—The crack extended through the entire section of the tire approximately 1 in. from the edge of the bolt hole in the retainer lip

Complexity of the various appurtenances installed on modern locomotives, coupled with the placing in service of a large number of older locomotives which have been out of service for periods ranging up to 10 years or more, many of which are practically obsolete and therefore not well adapted to the giving of satisfactory performance under present conditions, and the intensive use of all locomotives now in service necessitate increased vigilance on the part of all concerned to effectuate the purpose of the act and to comply with the proclamation of the President, dated August 18, 1941. This proclamation calls upon the National Safety Council to mobilize its nation-wide resources in leading a concerted and intensified campaign against accidents, and also calls upon every citizen, in public or private capacity, to enlist in this campaign and do his part in preventing wastage of human and material resources through accidents.

Continuous improvements have been made in design and construction of locomotives since the inception of the use of steam power on railroads and improvements will continue, in some measure, in new production during the emergency. All of the outstanding improvements in locomotive design and construction, as with practically all other mechanisms, have been brought about by the process of evolution rather than revolution. All have gone through periods of trial and adjustment, and many have been materially changed from the original conception before satisfactory performance could be obtained.

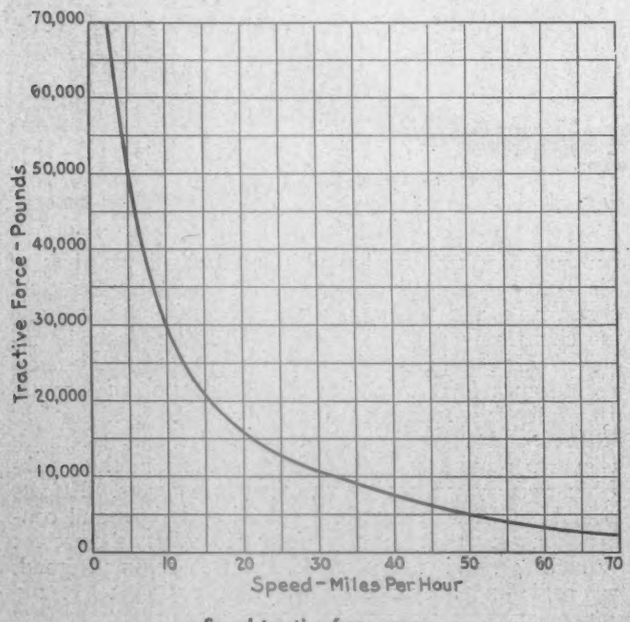
It therefore cannot be expected that major changes in design, construction methods, or practices will produce any appreciable beneficial effect in time to ease the current and prospective general situation. On the contrary, attempts to produce such changes, due to the accompanying necessary variation in established practices of the builders and the railroads, the necessity for close observation and supervision over the trial periods, and the changes in or the transfer of skill that may be required of the builders' employees and the railroads' maintenance forces, would delay production of locomotives, absorb manpower that could well be used for immediate and more important purposes, and result in delays to repairs because of interruptions in the established orderly work of the maintenance forces. Efforts to build and use locomotives involving designs and constructions that have not fully justified themselves through general use should, for the common good, be held in abeyance until the cessation of the emergency.

Alco-G.E. Road Switchers

New design of Diesel-electric locomotive has 69,000-lb. starting tractive force and is adapted for service at 70 m.p.h. maximum speeds

SEVERAL railroads have already taken delivery of Diesel-electric road switching locomotives of a design developed jointly by the American Locomotive Company and General Electric Company and built at the Schenectady plant of the former company. These locomotives are designed for road service at speeds up to 70 m.p.h. and, when used for passenger terminal switching or main-line service, can be equipped with train heating boilers. While the basic design of this type of locomotive is essentially the same as the yard switching locomotives which this builder has been delivering for some time, this new type has high-speed trucks; a short additional hood to accommodate the heating boiler; multiple-unit control and a higher gear ratio.

The general structure of the locomotive consists of a welded steel underframe carried on cast steel swivel trucks. The operator's cab is located near one end with a long forward hood enclosing the power plant, auxiliary generator, air compressor and contactors. The radiator compartment is at the front of this hood and the auxiliaries follow in the order named from front to rear. The rear hood of the same size except shorter, encloses the train heating boiler, when furnished.



Speed-tractive-force curve

The windows in the cab are exceptionally large, giving good visibility over the top of the hoods. Visibility is further improved by an elevated operator's seat. The cab is heated by an automotive type hot water heater.

The Diesel Engine

The Alco 1,000-hp. Diesel engine is a 12½-in. by 13-in. engine of the turbo-charged type (Buchi system). Generally speaking, it is similar to that found on other Alco Diesel-electric locomotives.

The water and oil-cooling radiators are of the sectional core type. The radiator fans are V-belt-driven from the engine and shutters, operated by a control in the cab, are applied outside of the radiators. To maintain a nearly constant load on the radiator fan, by-pass shutters are located inside the radiator compartment. They are so arranged that a corresponding graduated movement of the by-pass shutters occurs automatically with a movement of the outside shutters. When the outside shutters are closed, the by-pass shutters are open, and vice versa. This allows complete control of the degree of cooling desired.

Electrical Equipment

The electrical equipment is built entirely by the General Electric Company. It includes the main traction

generator, a belt-driven exciter auxiliary generator, four GE-731 series traction motors and complete Type P control equipment.

The main generator is supported by the engine frame and two spring-loaded feet attached to the generator frame. This construction insures alinement between the engine and the generator armature. A single self-alining roller bearing is used at the outboard end of the armature shaft. The auxiliary set consists of a split-pole exciter which furnishes excitation to the main generator and an auxiliary generator which supplies power for the control circuits, the electrically operated auxiliaries and for charging a 32-cell starting and lighting battery. The armatures of the two machines are on the same shaft. The main generator furnishes power for the four direct-current commutating-pole traction motors which are permanently connected two in series. These motors are supported in the locomotive truck by sleeve-type axle bearings and spring-nose suspension from the truck frame. The motor armature bearings are the roller type. The armature shaft is so installed that it can be removed without disturbing the windings or commutator. The motor frame is an integral steel casting and has large openings for inspecting brushes.

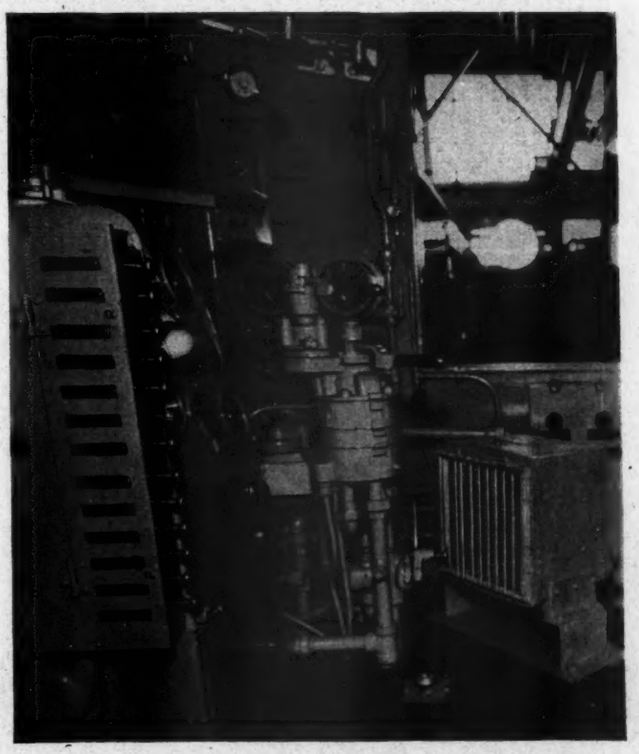
Comparative Characteristics of Alco-G.E. 1,000-Hp. Diesel-Electric Road and Yard Switcher

	Road Switcher	Yard Switcher
Driving motors, number	Four	Four
Maximum speed restriction, m.p.h.	70	60
Gear ratio, traction motors	73/18	75/16
Driving wheels, number (pairs)	Four	Four
diameter, in.	40	40
Weights:		
On drivers, lb.	230,000	230,000
Total locomotive, lb.	230,000	230,000
Wheelbase, each truck rigid, ft.-in.	9-4	8-0
Total locomotive, ft.-in.	40-4	30-6
Maximum overall locomotive dimensions:		
Height, ft.-in.	14-6	14-6
Width, ft.-in.	10-0	10-0
Length, inside knuckles, ft.-in.	54-11¾	45-5¾
Starting tractive force (at 30 per cent adhesion), lb.	69,000	69,000
Tractive force, continuous, lb.	29,500	34,000
Minimum radius curvature (locomotive alone), ft.	100	50
Lubricating oil, gal.	80	80
Engine cooling water, gal.	240	240
Sand, cu. ft.	27	27
Capacity, boiler water tank (with heating boiler), gal.	800	...
Capacity, fuel oil tank (with heating boiler), gal.	800	...
Capacity fuel oil (without heating boiler), gal.	1,600 (two tanks)	635 (one tank)

The Type P single-end, single-unit control functions with a minimum of attention on the part of the engine operator. The initial movement of the locomotive throttle closes contacts which operate the main circuit and field contactors. Additional movement of this throttle controls the engine governor, regulating the speed of the locomotive. The traction-motor reverser and line contactors are pneumatically operated and the remaining contactors magnetically operated.

The traction motors are arranged to operate in series and series parallel, and there are also connections for shunt-field operation. The motor connections are changed automatically from series to series-parallel and from series-parallel-full-field to shunt-field operation.

Automatic transfers are provided not only at rated engine speed but over the entire operating speed range of the engine. The relay which effects this automatic control materially increases the engine utilization during partial control and as a result more rapid acceleration as well as higher average and top locomotive speeds are



The controls at the operator's station—An automotive type hot-water heater is used in the cab

The trucks for these locomotives are designed with both helical and elliptic springs for good riding qualities at moderately high speeds

obtained when operated at reduced engine speeds. A current relay and indicating light give visible warning when the locomotive is operating below the proper speed range with the motors in the series-parallel connection. A wheel slipping relay with a buzzer also operates to warn the operator when any pair of wheels slips.

The master controller is used to select the motor combination and the direction of movement of the locomotive. This controller has three forward, one off and three reverse positions. When the controller handle is placed in the third operating position before opening the throttle, the motor connections will then be changed automatically from series to series-parallel and field shunting without attention on the part of the operator. If desired, the handle can be placed in the first forward or first reverse position so that it will maintain series connections of the motors. A multi-button switch at the operating stations gives the engineer control of the fuel pump, engine starting and the several lighting circuits.

The multiple-unit feature which may be used with this control equipment permits two of these units to be operated in multiple, making, for example, a freight locomotive of 2,000 hp.

The Heating Boiler

The largest size boiler that can be located under the short hood has a capacity of 2,250 lb. per hr. It is manufactured by the Vapor Car Heating Company. The size of boiler installed in the locomotive depends entirely upon the service the locomotive is to be used in. In some cases a 1,600 lb. per hr. boiler may be adequate.

One 800 gal. tank is located under the frame between the trucks to carry boiler water. If a boiler is not installed in the locomotive this tank is piped to the fuel oil tank of 800 gal. This means the locomotive will then have a total capacity of 1,600 gal. of fuel.

Trucks and Brake Equipment

The trucks used on the road switching locomotives are of the swing bolster drop equalizer type suitable for operation at moderately high speeds. These trucks are manufactured by the General Steel Castings Corporation. The truck wheelbase is 9 ft. 4 in. and the journal boxes are arranged for the lateral thrust to be taken on the ends of the axles. The axles have 7 in. by 14 in. plain journals with collars.

The truck wheels are 40 in. in diameter and provision is made for two GE-731 traction motors in each truck with the necessary connections for ventilating air ducts at the top of each motor direct from ducts in the cab underframe. The motor nose suspension is of the spring type. The spring rigging includes elliptic springs between the bolster and the truck frame and helical springs to carry the side frame on the equalizers. Two helical springs are used side by side at each end of each equalizer. The center plate and the journal box pedestal faces are equipped with wear plates. The truck brake equipment consists of clasp type brakes, permitting the use of flanged type brake shoes. Four 9-in. by 8-in. brake cylinders are outside mounted on each truck.

The air brake equipment for the locomotive is the Type 14-EL. The Westinghouse air compressor is driven directly from the main engine shaft and is a two-stage air cooled compressor with a capacity of 228 cu. ft. per min. at 740 r.p.m. and 83 cu. ft. per minute at engine idling speed.

Road switchers of this type have been delivered to the Atlanta & Saint Andrews Bay; the Chicago, Rock Island & Pacific; the Chicago, Milwaukee, St. Paul & Pacific, and the Tennessee Coal, Iron and Railroad Company.

Universal Brake Beam Safety Support

A brake-beam safety support, designed to be applicable to any type of freight-car truck and give positive assurance against dropping of the brake beams under any conditions of brake hanger or brake-head failure, has recently been developed by the Grip Nut Company, Chicago. This new support, known as the Universal brake-beam safety support, has been thoroughly tested at the Armour Institute of Technology laboratories, the cable failing at a load of 17,170 lb., which indicates a high factor of safety based on a maximum tangential load of approximately 1,500 lb. on the brake hanger. This particular type of safety support has been approved by the A. A. R., Mechanical division, as an acceptable equivalent for use on cars in interchange service.

The new brake-beam safety support consists simply of a short length of ½-in. double-galvanized cable (two

Universal brake-beam safety support applied to a conventional freight-car truck—The cables, attached to the tension rod, clear the bolster

per truck), connected by means of a special malleable-iron fitting on each end to the tension members of the two brake beams and extending up to and over the

A steel guard extends under the compression member

bolster with about 1 in. to 1½ in. clearance, where the cable shape is fixed by means of a formed section of ½-in. pipe which encloses it. This safety support does

(*Continued on page 66*)

Bureau of Safety Report

After the passage of 65 per cent of the 10-year period for complete AB brake installations less than 26 per cent of the freight cars in interchange have been equipped—Current traffic conditions have introduced increased hazards and necessitate increased inspection and supervision to insure that safety is not sacrificed, says the report

DURING the fiscal year ended June 30, 1941, the annual report of S. N. Mills, director of the Bureau of Safety, Interstate Commerce Commission, records the fact that a total of 1,082,598 freight cars were inspected; that 30,443 safety-appliance defects were found on 26,634 cars; that 23,660 passenger cars were inspected and 947 defects found on 664 cars, and that 13,432 locomotives were inspected and 1,247 defects found on 812 locomotives. The combined total of cars and locomotives inspected was 1,119,690 and the number of defects per 1,000 units inspected was 29.15 compared with 30.43 for the preceding fiscal year.

During the year, air-brake tests were made on 2,798 trains prepared for departure from terminals. These trains consisted of 121,476 cars, on which air brakes of 121,378 cars, or 99.92 per cent of the total, were operative. Air-brake tests were made on 942 trains upon arrival at terminals; these trains consisted of 46,427 cars, on which air brakes of 45,728 cars, or 98.49 per cent of the total, were operative.

In departing trains on which terminal tests of air brakes were made, all cars except 98 had operative brakes; however, in order to secure the percentages of operative brakes shown in the reports of these tests as submitted by our inspectors, 975 cars having defective or inoperative brakes were set out, and defective or inoperative brakes were repaired on 926 cars remaining in the trains. It should be borne in mind that these figures refer to trains which had been prepared for departure; yet, when afterward tested by our inspectors, it was found necessary to set out, or repair the brakes on, an average of 2 cars for every 3 trains.

In the 942 arriving trains tested, inoperative brakes were found on 699 cars, an average of 3 cars with inoperative brakes for every 4 trains tested.

In the last annual report attention was called to the discrepancy existing between safety-appliance equipment installed on streamline passenger-train cars, constructed in recent years, and specifications for safety appliances of passenger-train cars contained in the Commission's order of March 13, 1911; also mention was made of use by certain carriers of devices designed to make lock blocks of tight-lock couplers inoperative in order to compensate for defects in the coupler which were productive of undesired separation of trains. Use of improper running boards on steam locomotives, and also of incorrect end and side handholds on steam and Diesel-electric locomotives, were mentioned. Progress in securing correction of these defective installations was made during the year and, as to safety appliances of streamline passenger-train cars, correction is nearly completed.

During the year, 32 complaints were investigated; 18 of these complaints referred to power brakes and 14 complaints referred to other safety appliances. In 6 cases, evidence of violation of law was obtained and prosecutions were instituted. In most of the other cases corrections of the conditions complained of were effected as a result of the investigations.

Summary of Defective Appliances on Freight and Passenger Cars and Locomotives Reported by Inspectors During the Fiscal Year Ended June 30, 1941

	Inspected	Defective	Per cent defective	Defects reported
Freight cars	1,082,598	26,634	2.46	30,443
Passenger cars	23,660	664	2.81	947
Locomotives	13,432	812	6.05	1,247

NUMBER OF DEFECTS PER 1,000 INSPECTED

Coupler	.54
Knuckle	.17
Lock block	2.25
Uncoupling mechanism	1.77
End lock	.05
Keeper	.07
Visible parts of air brake	10.86
Handhold	2.84
Handrail	.15
Ladder	1.33
Running board	2.82
Brake shaft	.85
Brake wheel	1.05
Ratchet wheel	.73
Brake pawl	.38
Brake step	.14
Brake-shaft stirrup	.07
Brake-shaft support	.11
Ratchet brake	.04
Gear brake	.04
Brake chain	.49
Hand-brake rod	.08
Top truck rod	.08
Bottom truck rod	.002
Cylinder rod	.004
Floating-lever fulcrum	.004
Cylinder lever	.006
Floating lever	.004
Truck levers	.03
Brake beam	.33
Brake shoe	.51
Brake hanger	.04
Cotter keys for foundation brake rigging	.09
Hand brake	.49
Sill step	.61
Platform sill step	.02
Side-door sill step	.02
Footboard sill step	.05
Pilot sill step	.005
Step for headlight	.007
Power brake	.007
All classes	29.15

Progress of AB Brake Installation Slow

The following is a record as of June 30, 1941, of the number and percentage of interchange freight cars equipped with power brakes conforming to specifications of the Association of American Railroads, effective September 1, 1933:

Car owners reporting	Number of owners reporting	Number of cars owned	Number of cars equipped with such brakes	Per cent
Railroads	168	1,744,574	483,240	27.70
Private car lines	198	276,838	37,901	13.69
Total	366	2,021,412	521,141	25.78

This record indicates an increase during the year of 142,745 cars equipped with brakes of this type; of this number 65,719 were new cars. A rule adopted by the Association of American Railroads, effective January 1, 1935, requires all freight cars in interchange service to be equipped on or before January 1, 1945, with air brakes conforming with these specifications. As shown by the foregoing record, during 6½ years, or 65 per cent of the 10-year period allotted for making this improvement, only 25.78 per cent of the freight cars in interchange service have been equipped with the present standard apparatus.

For the past 4 years each annual report of this Bureau has directed attention to unsatisfactory progress in this connection and has urged action to expedite this installation. Analysis of the situation as of December 31, 1940, disclosed that 1,031,658 cars, owned by 125 railroads, which were not then equipped with the improved type of air brakes were scheduled to be continued in service beyond January 1 1945, and that only 71,622 of these cars were scheduled to be equipped with the new air brakes during the year 1941. On this basis more than 14 years would be required to complete installation of this equipment; furthermore, 53 of these 125 railroads, owning 347,322 of these cars, reported no air-brake-conversion program for the year 1941. As shown by the percentages in the foregoing table, the private-car lines have made even less progress than the railroads.

Certain hopper cars are constructed with arched ends of such design that top treads of end ladders cannot be located in conformity with the Commission's order specifying safety-appliance standards. These cars do not conform with the Commission's requirements or with the standard practice of the A. A. R.

During the year the Bureau continued its cooperation with the Association of American Railroads in a series of tests to determine the proper cleaning period for "AB" brakes. The results reported during the year disclosed material improvement, largely due to the use of improved air strainers.

In the fiscal year 1936 the Bureau cooperated with the Association of American Railroads in formulating standard specifications covering geared hand brakes for freight cars, and at present a series of tests is in progress to determine whether devices placed in service under those specifications comply with the requirements.

On June 30, 1941, 43 railroads and 6 private car lines had reported a total of 25,770 freight cars which had been equipped with metallic running boards of various types, as authorized by the Commission's order of December 17, 1932, and preceding orders of similar nature. During the year our inspectors reported the results of numerous inspections of these installations.

Hours of Service

During the year ended June 30, 1941, hours-of-service reports were filed by 755 railroads; of these, 174 reported a total of 7,409 instances of all classes of excess service, an increase of 3,140 instances as compared with the previous year; the remaining 581 roads filed reports showing that no service in excess of that authorized by the law was performed by their employees.

The 7,409 instances of excess service reported comprise 1,456 employees who remained on duty longer than 16 consecutive hours; 238 employees who continued on duty after having been on duty 16 hours in the aggregate in a 24-hour period; 24 employees who, having been on duty 16 consecutive hours, were returned to duty with less than 10 consecutive hours off duty; 1 employee, who, having been on duty longer than 16 hours in the aggregate in a 24-hour period, was returned to duty with less than 8 consecutive hours off duty; 5,480 employees at continuously operated offices who remained on duty longer than 9 hours and 210 employees at offices operated only during the daytime who remained on duty longer than 13 hours.

Accident Prevention

By a proclamation issued August 18, 1941, the President directed attention to the wastage of human and material resources of the Nation through accidents, and called upon all citizens in public or private capacity to engage in a campaign for the prevention of accidents.

The provisions of law and the orders of the Commission upon which the work of the Bureau of Safety is based establish fundamental and minimum requirements which are essential to safe and efficient railroad operation. Effective administration of these provisions has been an important factor in the reduction in accidents and casualties which has been achieved during the past 20 years. Continued effective administration of these provisions is imperative. Current traffic conditions have introduced increased hazards. Cars which have been stored are being placed in service, cars in service are being utilized to a greater extent, increased numbers of trains are being operated, there has been a material increase in the number of railroad employees who are engaged in or connected with the movement of trains, and extensive revisions of signal systems are in progress to expedite and safeguard increasing traffic. These conditions necessitate increased inspection and supervision to insure that safety is not sacrificed to the rush and hurry of the day, that defective equipment is not used in an effort to promote the convenience of the moment, and that there is no relaxation of the precautions and standards which are necessary for the safety of railroad operation and the protection of railroad employees who form the vital elements of an efficient transportation system. As the President very aptly stated, these unusual times require unusual safety efforts. The forces and facilities of the Bureau of Safety are being utilized to full capacity, as set forth in detail in the foregoing portions of this report. The maintenance of adequate safety standards in railroad operation is essential to uninterrupted flow of traffic and proper development and functioning of national-defense activities.

Universal Brake-Beam Safety Support

(*Continued from page 64*)

not touch the bolster at any point, but will come into action immediately on the failure of any part of the brake beam or brake-beam hanger. Provisions for supporting the brake-beam compression member in case it becomes disengaged from the brake head is afforded by ½-in. by 2-in. steel guards which extend around the compression members and are held rigidly between the malleable fittings and the tension members by U-bolt and Grip Nut connections, as shown in one of the close-up views. The cable is anchored in the malleable fittings by expanding the wires and filling the taper cavities with molten zinc.

Only one design is required on either the conventional or spring-plankless freight-car truck. Additional advantages include the complete elimination of moving parts and consequent wear; all parts are subject to tension only, while functioning; number of working parts minimized; elimination of spring-plank drilling and unbalanced loading; possibility of replacing brake beams by the removal and replacement of four ½-in. nuts.

EDITORIALS

Our Contest

Seventy-five papers were received in the *Railway Mechanical Engineer* competition for the two best papers on ways and means of improving the mechanical department's operations or practices to increase production and secure a larger use from the equipment and facilities. The subjects discussed by the contestants cover such a wide range of mechanical department activities that the task of judging the papers and selecting the winners promises to be no easy one. We have examined the contributions sufficiently, however, to come to one very definite conclusion. The material contained in them is of such value that we propose to devote the greater part, or all of our April issue, to its presentation. The prize winning papers will, of course, be presented in full, with the usual editing, but several of the other papers also will probably be used in whole or in large part. In addition to this, high spot material will be selected from a large number of the contributions. That will be the program for our April issue, as we see it now.

Save it or Scrap It?

Usable second-hand material is frequently a life saver in these times to shop foremen, maintenance men and others on a railroad property who have a job to do and find that new materials are not on hand and will not be available for weeks or months. However, the practice of saving everything that might possibly be useful at some future date can be carried to extremes. Steel mills are crying for scrap with which to maintain open-hearth production and, in consideration of their need, no other industry is justified in the maintenance of large stock piles of second-hand materials unless there is a probable definite need for the material saved. General orders issued to save all usable second-hand material on the chance that it may some day come in handy can adversely affect the supply of new materials immediately required. Good judgment may dictate that certain parts, sheet steel or shapes be retained when cars and locomotives are stripped for repair or dismantled, but this judgment is one to be exercised by someone who is in a position to know the real value and need for such saving in the light of production requirements and the availability of new materials of the same type.

Second-hand materials will help to repair cars and locomotives but will not build new ones; scrap with the additions of ore in the open hearths will furnish the steel required in the programs now under way to increase the motive power and rolling stock of the railroads in the present emergency. It may well be that on the properties of the railroads today, in so-called second-hand stock piles, is a part of the answer to the problem of obtaining new steel.

Conserving Rubber Hose

Earnest consideration is now being given to the subject of conserving rubber in all of its forms and combinations as now used in railway equipment and at railway shops and engine terminals throughout the country. A considerable amount of rubber in the aggregate is utilized in the construction of passenger-car trucks and draft gears, to promote smooth, quiet operation; for seat cushions, mattresses, carpet pads, etc., in passenger cars; and also for certain types of spring snubbers in freight cars. Unquestionably the greatest single use of rubber by the railways however, is for the multitudinous different kinds and sizes of rubber hose required for air-brake, steam, water and signal-line connections between cars and locomotives; for squirt hose on locomotives, and for the extensive air, steam and water lines used in railway shops and engine terminals for such purposes as operating air tools, washing boilers and cars, gas welding, sandblasting, etc.

Experiments are now under way looking toward the use of substitute materials wherever possible and it is obvious that every effort should be made to minimize the use of rubber hose and extend the life of that which must be employed. In view of the indispensable part which transportation plays in national defense and the fact that, without maintenance, equipment cannot be kept in service, it seems certain that enough rubber hose to meet railroad minimum requirements must and will be made available, but it is a patriotic duty of railway men to conserve this important defense material in every way possible.

Definite steps are being taken at the present time, for example, to see what can be done to reclaim porous air-brake hose by vulcanizing the interior when the fabric is uninjured and, except for a slight porosity, the hose

is in condition to give satisfactory service for an extended period of time. In railway shops and engine terminals much can be done to reduce the amount of rubber hose required by extending pipe lines so that shorter lengths of hose will reach the work. Rubber hose, issued from the tool room, may be supplied in reduced lengths which are long enough for ordinary air-tool operations, but which may be coupled together when, on occasion, it is necessary to reach work at a more distant point. At practically every railway shop and engine terminal in the country careful checking will doubtless show some opportunity to extend the life of rubber hose by greater care in handling; protecting hose at all walkways where trucks must pass; and swinging hose from overhead supports, wherever possible, to avoid dragging it on the ground or shop floor. The importance of this work, in the interest of economy as well as national defense, is such as probably to justify appointing some supervisor, lead man or special committee at each shop point with the primary job of conserving rubber hose and having authority to enforce such shop regulations and recommended practices as may be adopted having this end in view.

Orders for Diesel Power Set New Record in 1941

Each year for the past three or four years, in commenting on the extent to which Diesel-powered locomotives have been ordered by the railroads, it has been possible to say that the number of units ordered has served to create new records with respect to such installations. At the end of 1939, the end of a 15-year period since the first 300-hp. Diesel-electric switcher was placed in service, there was a total of 674 Diesel switching and road locomotives in service on the railroads of the United States. In the field of switching locomotives alone, the total engine horsepower at the end of 1939 was 397,380, while at the same time there was only 72,000 hp. of road-passenger locomotives in service, there having been no road freight locomotives introduced up to that time.

In the year 1940 the roads went into the buying of Diesel-electric power in earnest, having introduced 340 switching locomotives with a total engine horsepower of 240,640; 62 road-passenger locomotives with a total engine horsepower of 168,000; and, for the first time, eight road freight locomotives having a total of 21,600 hp. The year 1940, therefore, set a new record for Diesel installations with over 400 units installed, having a total horsepower of over 430,000. Cumulative totals at the end of the year 1940 were 1,084 Diesel-powered locomotives in service having a total engine horsepower of 1,006,320.

The orders placed for this type of motive power during the year 1941 not only set some more new records with respect to the number of units but also established some significant trends. The orders during last year for 598 switching locomotives with a total of 468,000 hp. brought the total number of switchers in service for the 17-year period up to 1,539, having an aggregate engine horsepower of 1,106,138. At the same time there were 122 Diesel road locomotives ordered, 62 passenger locomotives of a total of 166,800 hp., and 60 road-freight locomotives having a total of 238,110 hp. The orders during 1941 brought the total number of Diesel-powered locomotives of all types in railroad service to 1,804 with an aggregate engine horsepower of 1,879,348. During the last four or five years, cumulative total engine horsepower of all Diesel-powered locomotives has almost been double that of the previous year.

Before commenting on some of the interesting trends in connection with the installation of this type of power, it is worth while to observe what the influence of the installation of Diesel-powered switching locomotives has been on the use of steam switchers. In the five-year period ending in 1929, 729 steam switchers were ordered, and at the end of 1929 the Class I roads owned 10,416 steam switchers having an aggregate tractive force of over 383 million lb. Five years later, by the end of 1934, the ownership of steam switchers had dropped to 8,712, having an aggregate tractive force of 342 million lb. During that five-year period, only 118 new steam switchers were ordered from builders. In the next five-year period, ending with 1939, 93 new steam switching units were ordered but the ownership had dropped to 7,509 with an aggregate tractive force of 306 million lb. In the two following years, 1940 and 1941, only six steam switchers were ordered and the ownership of that type of motive power at the end of 1941 was 7,115, having an aggregate tractive force of 295 million lb. The affect of the installation of Diesel switchers may be seen in the fact that while 1,539 Diesel-powered units were being installed, the inventory of steam switchers decreased by 3,587 units. The decrease in aggregate tractive force from 1925 to 1941 was 66 million lb.

Considering Diesel switching locomotives alone, the average locomotive horsepower increased from 450 in 1929 to 730 in 1939. The next year, 1940, witnessed the installation of 340 new units with a decided decrease in average locomotive horsepower. That year was a year of transition in which the large 1,000-hp. units had not yet been ordered in any great number and relatively large numbers of switching locomotives of less than 600 hp. were ordered, thus bringing down the average locomotive horsepower. In spite of the fact that in 1941 the number of small switching locomotives of less than 600 hp. increased considerably, there was also a tremendous increase in orders for the 1,000-hp. units. The railroads ordered 89 of these small switchers out of a total of 598, but while the number of units represented roughly 15 per cent of all the switchers ordered in 1941 the total engine horsepower—32,600—of these 89 small units represented but 7 per cent of the total horsepower of all switching

units. The average locomotive horsepower for the year 1941 was 780. This figure compares with 603 for the previous year, 730 for 1939 and 450 for the year 1929.

While there were eight road freight locomotives ordered in 1940, last year may be recorded as the year in which the road freight locomotive was really introduced on American railroads. The ordering of 60 units, having a total of 238,000 hp. is worth recording because it surpassed the total horsepower of the 62 units ordered for road passenger service by 71,000.

The record at the end of 17 years during which the Diesel has been in the service on American railroads stands at a total of 1,539 switching locomotives and 265 road locomotives. The average horsepower of all switching locomotives in service is 719 and of all road locomotives 2,920. A significant fact is that the inventory of steam switchers decreased but 400 units in the last two years as compared with 1,700 units in the five-year period from 1930 to 1934 inclusive, during which Diesel switcher installations began to assume proportions.

Safety—A Conservation Measure

In the annual reports of the directors of the Bureau of Locomotive Inspection and the Bureau of Safety, both of which are reviewed in this issue, stress is placed upon the proclamation of the President dated August 18, 1941, in which he directed attention to the wastage of human and material resources through accidents, and called upon the National Safety Council to mobilize its nation-wide resources in leading an intensified campaign against accidents. Both reports point out the special hazards, inherent in current traffic conditions on the railroads, which require increased attention to inspection and greater vigilance on the part of everyone concerned with keeping cars and locomotives in condition to render safe and reliable service, if accidents are not to increase. Fortunately, all types of equipment are in good condition, but it will require great energy and determination if the pressure and the temptation to relax current high standards of maintenance are to be resisted as the demand for equipment becomes more acute.

In the Bureau of Locomotive Inspection report particular attention is directed to the waste of material as well as the risk involved in making temporary repairs in the hope that a better opportunity will present itself later to do the thorough job which is really needed.

The experience of the city of London, England, in dealing with bombing damage is pertinent in this connection. After thorough consideration, it is said that the policy was adopted of making immediate permanent repairs to all underground services and all street surfaces damaged or destroyed by bombing, because of the great additional cost which would be involved in doing the whole job over again if temporary repairs were made immediately following the damage. Certainly the pressure to mend damage with the least immediate expenditure of labor and materials in that instance was as great as anything American railroads will be subjected to during the coming months of stress.

That some railroads have not been free from the practice of "going through the motions" without effective results has been clearly evident in locomotive accident reports for a long time. "We sometimes find reports on the defects that caused the accident repeated many times," says the 1941 report of the Director of the Bureau of Locomotive Inspection, "until failure eventually occurred, together with signatures on the reports indicating that the reported work had been done, or attempted, each time a report was made. This is proof that the safe repairs required to secure dependable operation of the locomotive had not been made and that labor and time had been wasted."

This condition has long applied to accidents caused by one class of crown-sheet failures. Investigations after boiler explosions have frequently revealed that defective operation of boiler feedwater devices have been repeatedly reported, repeatedly tinkered, but not restored to effective condition, ultimately becoming involved in one of the most violent types of accidents which can happen on a railroad. Although the number of accidents caused by these failures is small as compared to the total number of accidents caused by the failure of steam locomotives and their appurtenances, they continue year after year to account for a very large proportion of the deaths and their potential capacity for the destruction of property is tremendous.

These accidents are classified in two groups, those for which no contributory causes were found and those for which contributory causes or defects were found. It is true that there were only four accidents of the latter type, but they caused five deaths, and from them there is a disturbing lack of immunity.

Those of both groups, which together were the cause of 15 deaths during the last fiscal year, pose particularly difficult problems of supervision, because they both arise from the tendency toward callousness which insidiously creeps into men's attitudes toward risks with which they are constantly associated. This is reflected in the foremen's lack of sensitiveness to the implications of reports of frequently recurring defects in the same device on the same locomotive, and on the functioning of which men's lives depend. It is reflected, in the perfunctory attitude of the men whose lives are at stake toward maintaining and checking the level of the water in the boiler.

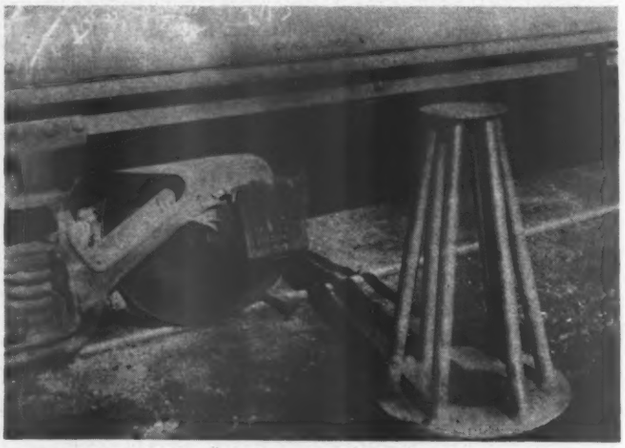
Surely the hazards involved are great enough to justify frequent checks on the attitude and procedure of foremen with respect to the maintenance of locomotive boiler feedwater apparatus, and special attention to developing precise habits of checking the water level when the locomotive is in service.

Rose Lake Car Shop Devices

Several devices, shown in the illustrations, are used effectively to expedite the work of repairing freight cars at the Rose Lake shops of the Pennsylvania, East St. Louis, Ill. The first view shows a neat and very efficient jib crane, also the greased-rail arrangement used in storing and handling car bolsters, which weigh about 600 lb. apiece and are difficult to move around without the proper mechanical handling facilities.

The feature of special interest about the jib crane is the way in which the vertical post is mounted. This post consists of a 12-ft. section of 130-lb. steel rail, 5 ft. of which is set in the ground in a heavy reinforced concrete base so as to keep the rail both perpendicular and steady under the heaviest load which may be applied at the end of the boom. As a matter of fact, in setting this vertical rail, a hole was dug 5 ft. in diameter by 5 ft. deep and the rail set in a sheet-metal drum located at the center of the hole. The drum was loosely filled with scrap iron bars and then concrete was poured in and carefully tamped to fill all cavities. Enough additional concrete was then poured into the hole to cover the barrel and form a partial cone 5 ft. in diameter at the bottom, 5 ft. high and 18 in. in diameter at the top. Since the Pennsylvania freight yards and shop grounds at Rose Lake are all filled-in marsh land, east of the Mississippi, it was necessary to take more than usual precautions in setting this steel rail in the ground to make sure that it would remain frigid and vertical.

The boom of the jib crane is made of two brake-beam channels placed back to back with ½-in. spacers between and riveted, in conjunction with a ½-in. by 2-in. scrap-



Lightweight but strong and easily portable tubular-steel car trestle

Jib crane and bolster storage rails at Rose Lake car shop

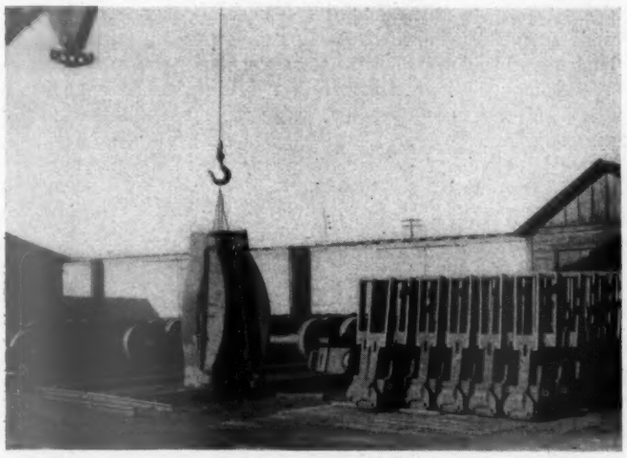
Lightweight welded tubular-steel hand ladder used for stencilling and other purposes

Two-wheel truck used in handling bolsters and couplers

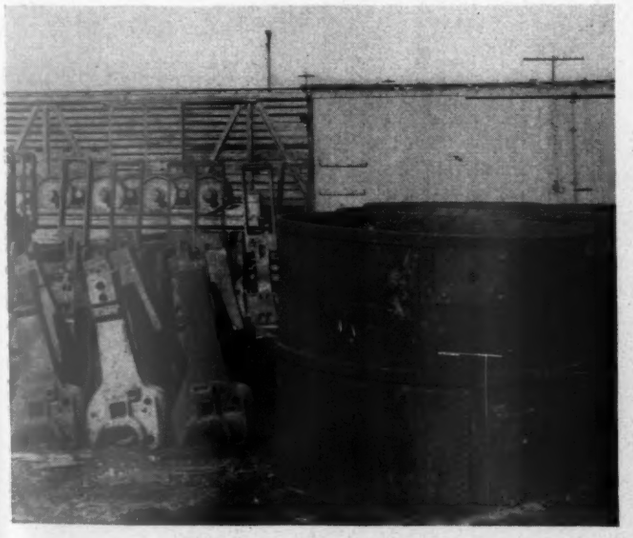
iron truss rod, to a bearing hinge, as illustrated. A coupler knuckle pin connects this hinge to a bearing bracket made of 1¼-in. by 5-in. steel, bent at right angles at the top and bottom, drilled with holes to accommodate the knuckle pin and securely fastened to the rail by means of six rivets through the rail base. A square-thread turn-buckle screw is used for lifting purposes, with a special hook for attachment to the bolster. The rails for bolster storage are set on wooden blocks about 14 in. high, spaced 26 in. apart, and are greased.

Referring to the second view, it will be noted that the bolsters are easily handled from the storage position by means of the jib crane onto a two-wheel truck which is also used in moving couplers to the cars where they are to be installed.

An unusually light but strong and rigid car tresle is shown in the third illustration. It consists of a base plate 24 in. in diameter made of ⅜-in. or ½-in. boiler steel and having a 10-in. circular section cut out of the center and used for the top of the tresle. This trestle is 36 in. high, but this dimension may be varied to suit the individual requirements at different shops. The top plate and base plate of this trestle are separated by six pieces of scrap 2-in. boiler tubes, which, however, have been carefully selected to make sure that they have ample strength. These tubes are cut at the proper angle, top and bottom, to fit the two plates accurately and they are electrically welded to form a single rigid structure which



Method of handling four bolsters with a multiple-chain connection from the locomotive crane hook—Reclaimed couplers at the right



Large-capacity scrap buckets are made of discarded oil drums and handled by the locomotive crane

is unusually light in weight and can be readily rolled along the ground from one position to another. Frictional resistance on the top surface of this car trestle is increased by the application of a number of raised electric-welded spots.

The ladder shown in the fourth illustration also is of tubular-steel construction, being made of ⅜-in. pipe with wooden treads 6 in. wide by 26 in. long and spaced 14 in. apart. The top tread is 12 in. wide, being supported on an enlargement of the ladder sides as shown in the illustration. The lower ends of the two pipe sections on each side are drawn together to a point and welded to give two non-slip points of contact with the ground. The step treads, except the one at the top, are supported on 1-in. angle-iron pieces welded between the side pipe sections. This ladder is 8 ft. long and used for stencilling cars, also for repairing side slats and doors on stock cars, as well as for similar operations on other classes of cars.

The fifth illustration shows how car bolsters are handled, both from the incoming car and also to the scrap car, by means of a four-chain extension from the locomotive crane hook, with a considerable saving of both time and labor. Reclaimed bolsters, also shown in this illustration, can be handled in the same way when necessary.

The sixth view shows one of a group of seven oil drums which have been converted into scrap buckets and are located at a central point at the Rose Lake car shop and used for the receipt and storage of scrap iron and steel car parts until such time as the drums are filled and can be emptied in the scrap car. One particular advantage of this method of handling scrap is that it can be segregated to a considerable extent before being placed in the scrap car and thus facilitate the work of unloading the car when received at the scrap dock.

The scrap bucket, illustrated, is made of an old oil drum 46 in. high by 52 in. in diameter, made of $\frac{3}{16}$-in. steel. A ½-in. by 9-in. by 12-in. reinforcing plate is riveted on each side of the drum near the top and drilled with a 2-in. hole for use with crane hooks in handling the bucket to and from the scrap car. A staple is riveted to the bottom of this bucket on the outside near the center for the attachment of a light chain used in tipping the bucket during the unloading operation. The scrap bucket is filled with a special spreader bar with two side chains and hooks by the main hoist and a chain attachment from the bottom of the bucket to the auxiliary hoist is used in dumping.

Sander for Increased Output

Added recently to the line of tools manufactured by the Black & Decker Mfg. Co., Towson, Md., a 9-in. heavy-duty sander is designed to meet present day requirements for more output per tool. It is equipped with a universal motor and is furnished for use on lines carrying 110, 220 or 250 volts. The spindle speed, without load is 5,000 r.p.m. Intended primarily for sanding operations, the tool is so designed that wire cup brushes, saucer grinding wheels for right-angle grinding, planer

Heavy-duty sander intended to provide greater output per tool unit

heads for wood shaping and surfacing, and other accessories can be used. A new spindle lock, having a spring release operated by thumb pressure, which gives a positive locking to the grinding discs being used is an improved feature.

Pullman Car Maintenance And Periodic Inspection

*By W. T. Kidwell**

In addition to the daily handling of Pullman cars in and out of the yard, the testing of and repairs to air brakes, trucks, and running gear, with which the car man is primarily concerned, there are such features as car cleaning, maintenance of the lighting and air conditioning systems, the thousand and one items of hardware that have to be maintained; painting; upholstering; exchange of linen; stocking car with supplies, etc., which The Pullman Company has to worry about. Briefly, here are some of the details of this work.

A person leaving a hotel room in the morning would not expect to find it in the same condition when he returned in the evening, but would expect it to be in a clean and tidy condition. This applies to a Pullman car. Much has to be done between arrival and departure, and quite often this has to be done within an hour or two. Cleanliness—that which first meets the eye—is always of prime importance. The car has to be aired out; rubbish collected and removed; plush, carpet and bedding vacuumized; windows cleaned, and interior finish wiped down. The rubber tiling is scrubbed; wash basins, hoppers, metal work and hardware are cleaned and polished. Linen is exchanged and car supplies checked.

At certain periods, the car is given special strip cleaning when bedding, seats, seat backs, etc., are set aside, and the car thoroughly blown out with compressed air. Also, as parts of the inside finish show signs of dullness, the woodwork, headlinings and bunklinings are thoroughly washed and chamoised, and certain parts polished with wax. The carpet is removed and blown with compressed air. Blankets, mattresses and pillow covers are exchanged and those removed sent out for special cleaning. Upholstering is carefully inspected and repaired. Painters are constantly at work refinishing damaged or faded parts of the inside finish.

Attention to the Lighting Equipment and Batteries

When the car leaves a terminal, the lighting equipment is on its own. If something went wrong there would be no one, in most cases, available to make repairs until the car reached the end of its run. To furnish ample power and steady lights the equipment must be fully automatic. It must receive inspection and periodical attention during the yard layover to assure its good operating condition. The power is provided by a belt-driven generator and battery located under the car, controlled by regulators usually placed inside the car. It operates the same as an automobile system, the generator furnishing power for the lights, fans, electric razors and other electric appliances, and for charging the battery while the car is running. When the car is standing the battery furnishes power for these devices.

The battery must be inspected for loose connections and proper ventilation, and the box cleaned out. Water has to be added occasionally, the same as with an automobile battery. Generator brushes wear out, get stuck with dirt; bearings develop defects and have to be replaced. The belt has to be inspected for wear and other conditions, and has to be replaced from time to time. Generator suspensions, pulleys, and belt tension apparatus

* Yard foreman, Pullman Company, St. Louis, Mo. Mr. Kidwell's paper, abstracted above, was awarded a prize of $15 as the second best of seven short papers presented by car men from the ranks before the Car Department Association of St. Louis during 1941.

Pullman service track at a large passenger terminal

must be inspected for defects. Regulators use carbon discs and are affected by dust, overheating and adjustments, and require checking at regular intervals. These are all items the car-lighting man must check, in addition to seeing that the wiring is not grounded. He also repairs switches, changes burnt-out bulbs, and looks after various other details inside of the car.

If the generator or battery fails, power for the lighting system can be obtained temporarily from an adjoining car by connecting the two with a trainline connector provided for this purpose, but there is no temporary means of getting cooled air when the air-conditioning apparatus fails. Inspection of this apparatus is, therefore, doubly important. The air-conditioning system consists essen-

A Pullman received at the coach yard at night for cleaning and servicing

tially of an air-circulating system, including apparatus for keeping the air in motion, cooling, heating, filtering and dehumidifying. The cooling apparatus, being the principal part, may be one of several mechanical types, a steam ejector, or an ice system, all in common use on Pullman cars.

Skilled Maintenance Required for Air-Cooling Apparatus

This apparatus is also fully automatic and only the closest attention at terminals by skilled maintenance men can provide the necessary assurance that it will operate properly throughout the trip. There are many operating parts that wear and get out of adjustment. Various kinds of lubricants are used periodically. Air filters, strainers, condensers, motors, speed controls and various control boxes have to be cleaned. Operating pressures and the adjustment of pressure switches and thermostatic valves require close and careful checking while the car is laying over in the yard. These, together with many details of lesser importance, keep the air-conditioning maintenance man always on the alert if he is to be a successful trouble-shooter.

It is the cooling equipment in the summer and the heating equipment in winter that he has to worry about. Along with air conditioning came the automatic control of temperature within the car when heat is required. This has progressed along with other features developed by the car builders. The passenger riding in the later type cars today can set the temperature in his room to suit his individual idea, and this temperature is maintained automatically. There are 45 automatic steam valves and 21 heating thermostats on the latest type of roomette car. In addition, there is an equal number of relays, control switches, and the necessary wiring to complete this system of control. There is much of this apparatus to be checked and repaired while the car lays over in the yard.

Small Items Demand Expert Attention

The hardware in a car is something else that meets the eye, and a passenger is quick to complain if something doesn't work right. Such items as door locks, handles, hinges, holders and checks, subject to severe service, require considerable attention. Water faucets must always provide a liberal flow of water, and not leak; basin drains must be kept clean so water will drain out quickly. There is the water-raising system with its automatic air-pressure-control valves, filling valves, strainers, etc., that have to be looked after.

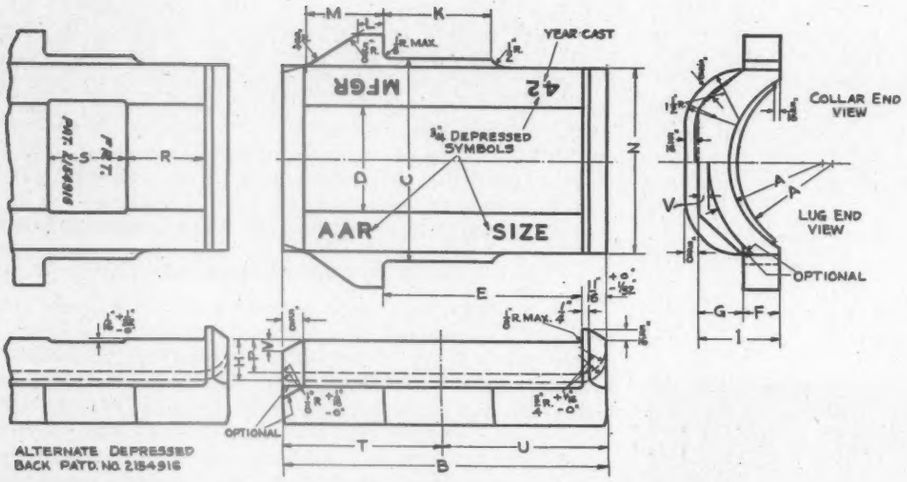
Hopper valves, especially on newer cars where the hopper folds back into a small cabinet, are highly complicated pieces of mechanism and subject to such defects as those caused by small grains of sand lodging on the valve seat, getting out of adjustment, worn gaskets, etc. Window glasses and mirrors get broken; window shades stick, screws become loose and may catch and tear a passenger's clothing. These, together with hundreds of smaller items of hardware on a car, require the constant attention of skilled mechanics.

The casual observer hasn't the slightest conception of what is required in the way of yard maintenance to present a car in neat and orderly appearance, with all the facilities functioning properly for his use and comfort. Were he to step into a railroad yard and watch the maintenance crew board the car and look after their work, to say he would be amazed is only putting it mildly; but it is a vital part of the Pullman service, and it is only a part of the whole job because, as all know only too well, railroad forces take care of an equally voluminous and complicated part of the work. All of us, if we are to work together smoothly and efficiently, must know something of the other fellow's job. What we are providing for the railroad passenger is something he accepts as a single unit when he buys his ticket, and to produce this successfully we must work as a single unit.

Journal Bearing Changed To Curtail Metal Content

Supplementing the circular letter issued recently by the Association of American Railroads, Mechanical Division, on the curtailment of the use of copper by the railroads, V. R. Hawthorne, executive vice-chairman, wrote to all members of the association on January 19, calling their attention to a modified design of journal bearing to be used during the present war emergency in order to conserve copper, tin and other critical materials. A drawing of the modified design was included with the letter. A number of changes in dimensions and some changes in form are shown.

In this letter, the manufacturers of journal bearings, including those railroads which make their own bearings, are urged to provide pattern equipment for the manufacture of this new design of bearing without delay.



Modified design of journal bearing specified by the A. A. R., Mechanical Division, for use during the present war emergency in order to conserve copper, tin and other critical materials

CLASS	SIZE JOURNAL	DIMENSIONS IN INCHES																			
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	R	S	T	U	V
A	3¾×7	1 25/32	6½	4¼	2	4 5/16	7/8	1⅛	15/16	2	5½	2¾	½	1 5/8	3¾	¾	1 11/16	2	3⅛	3⅜	¼
B	4¼×8	2 5/32	7½	4 5/8	2 5/16	4 11/16	2 7/32	1 9/32	15/16	2⅛	5⅞	2¾	5/8	1¾	4 3/8	¾	2 1/16	2¼	3 5/8	3 7/8	¼
C	5×9	2 11/32	8½	5 1/8	3⅛	5 3/8	1 13/32	1 7/32	1 1/16	2¼	6 7/8	3⅛	11/16	2 1/16	4 7/8	⅞	2 7/16	2½	4⅛	4 3/8	5/16
D	5½×10	2 25/32	9½	5 7/8	3⅛	5 7/8	1 1/16	1 5/16	1 1/16	2 3/8	7 3/8	3⅛	¾	2¼	5 3/8	⅞	2 5/16	2½	4 5/8	4 7/8	5/16
E	6×11	3 3/32	10½	6 7/8	3½	6 5/16	1¼	1½	1 3/16	2 3/4	8 3/8	4	13/16	2 7/16	6¼	1	3 5/16	2 3/4	5⅛	5 3/8	3/8
F	6½×12	3 3/32	11½	7 3/8	4	7 5/16	1 7/16	1 5/16	1 5/16	3	8 7/8	4	⅞	2 5/8	6½	1⅛	3½	3 3/8	5 5/8	5 7/8	3/8
PERMISSIBLE VARIATIONS																					
PLUS		1/32	1/32	1/32	1/32	1/16	1/32	3/64	1/16							1/32					
MINUS		1/64	1/32	1/32	1/32	1/32	3/64	0	1/32							1/32					

One of the features of this modified design is that the marking has been revised to eliminate the initials of the purchaser. This is also intended to conserve critical metals, as it will eliminate the necessity for manufacturers carrying a large stock of bearings for different purchasers and bearing the purchaser's initials or markings.

The Mechanical Division letter urges that every effort be made to conserve copper and other strategic metals contained in journal bearings. Owing to the great number of these bearings constantly wearing out and being renewed, the possible aggregate savings are very large.

The manufacturers of journal bearings are requested to supply bearings of the modified design as soon as their pattern equipment can be changed. It is pointed out that it will take some time before these new patterns are available and, in the meantime, it will be permissible to accept bearings made to the former standard design.

Decisions of Arbitration Cases

(The Arbitration Committee of the A. A. R. Mechanical Division is called upon to render decisions on a large number of questions and controversies which are submitted from time to time. As these matters are of interest not only to railroad officers but also to car inspectors and others, the Railway Mechanical Engineer will print abstracts of decisions as rendered.)

Improper Repairs Covering Control Valve Not Sustained

On January 4, 1939, the Atlantic Coast Line, while giving periodic attention to air brakes on Pacific Fruit Express car No. 739 reported removing and replacing a Type U-12-B control valve. On July 6, 1940, the Atchison, Topeka & Santa Fe performed similar work on this car and reported a Type U-12 control valve removed and replaced although the car still carried the stencilling that was applied by the A. C. L. on the aforementioned date. The car owner entered a claim against the A. C. L. for an adjustment covering the difference in value between the two types of control valves under Item 20-C of Passenger Rule 21. In its statement the P. F. E. said that there was no record of a control valve having been removed from that car for any reason between the above two dates and the facts that this car still carried the A. C. L. stencilling was proof that the Type U-12 valve found on the car by the A. T. & S. F. was applied by the A. C. L. The A. C. L. contended that its records showed the car to have left its lines with the Type U-12-B control valve and if a U-12 valve was found on the car by the A. T. & S. F. it was evidently applied after the car left the A. C. L. rails. The A. C. L. declined the claim of the P. F E. on the ground that joint evidence was not secured within the time limit and that the defect card of the A C. L. would not perform the same function as joint evidence. The A. C. L. contended further that joint evidence should be required in similar cases to protect the repairing line.

In a decision rendered April 10, 1941, the Arbitration Committee stated: "Investigation disclosed P. F. E. car No. 739 was in home shops at Stockton, Calif., on May 19, 1939, and at Roseville, Calif. on March 12, 1940; in view of which the principle of Case No. 1742 applies. The contention of the P. F. E. is not sustained."—*Case No. 1783, Pacific Fruit Express versus Atlantic Coast Line.*

Charges Involved in Change of Wheels

The Ft. Worth & Denver City substituted two pairs of second-hand multiple-wear wrought-steel wheels under Wilson Car Lines car No. 7569 on June 10, 1940, and billed the owner $87.36 to which exception was taken on the ground that the substitution of multiple-wear wrought-steel wheels for one-wear wrought-steel wheels

standard to the car the charge should be based on A. A. R. prices but in no case to exceed the A. A. R. price for new one-wear wrought-steel wheels as covered by Rule 70, paragraph (d). The car owner claimed that under Rule 70, paragraph (d) the bill should have amounted to $62.76 on the basis of four new one-wear wrought-steel wheels less scrap credit for four one-wear wrought-steel wheels and that the repairing line had made an over charge of $24.60. The car owner further contended that the reporting line, in making the bill, should have used the gross price of one-wear wrought-steel wheels instead of the gross price of multiple-wear wheels. The Ft. W. & D. C. did not agree that Rule 70, paragraph (d) required that charges and credits for wheels exchanged must be on the basis of the wheels standard to the car as claimed by the owner and further that, according to its records, the car was not stencilled to show what wheels were standard, nor were there any marks found on the wheels which would identify them as one-wear wheels. This accounted for the fact that the wheels were reported as multiple-wear wheels, exchanged in kind, resulting in the charge of $87.36. Further investigation, however, developed that the wheels removed were stamped with one-wear identification and on this basis a revised bill was prepared amounting to a net value of $98.40 which, under Rule 70 was reduced to $81.88 representing the value of two pairs of new wheels.

In a decision rendered April 10, 1941, the Arbitration Committee ruled that, inasmuch as the charge for wheels applied should not exceed the cost of new wrought-steel wheels standard to the car, the contention of the Wilson Car Lines was sustained.—*Case No. 1784, Wilson Car Lines versus Fort Worth & Denver City.*

Air Brake Questions and Answers

(AB-8, Empty and Load Equipment Continued)

87—*Q.—What care should be taken of the brake cylinder piston, rod and non-pressure head assemblies?* A.—Covers or containers should be provided to protect the assemblies from dirt or damage when transporting to and from the car.

88—*Q.—What type cover should be recommended for this purpose?* A.—A bag made of canvas or similar material, large enough to cover the entire assembly, with a draw string at the top to exclude all dirt.

89—*Q.—What should be done before starting the repair or cleaning operation?* A.—Record the car number, owner and last cleaning date if needed for billing purposes. All old marks should be cleaned off and painted over with quick-drying black paint.

90—*Q.—What should be done next?* A.—Close the branch pipe cock and drain the air out of the auxiliary and emergency reservoirs and brake cylinder. Remove the cup from the dirt collector and leave it off until the cleaned valve portions are applied. Disconnect the release valve lever, leaving it attached to the release rods.

91—*Q.—What should follow?* A.—Blow any dirt or water out of the yard air line and supply hose connection to the car. If the brake tests are to be made by the same men who clean the brake, the single car tester should be coupled to the yard line and the car brake pipe at the B end of the car.

92—*Q.—What should be done after coupling up the test device?* A.—Charge up the brake pipe and blow it out.

93—*Q.—How should this be done?* A.—By opening the angle cock at the *A* end of the car, after which a dummy coupling is applied to the hose on this end of the car. Leave both angle cocks open.

94—*Q.—What else should be blown out at this time?* A.—Open the branch pipe cut-out cock to blow dirt from the branch pipe and then close it.

95—*Q.—What should be done before removing the valve portions from the car?* A.—Scrape or blow off all dirt close to the joint faces between the bracket and the valve portions, also from the portions and their bracket, hopper slopes, car underframes, etc. This is done in order to prevent any dirt from getting into the parts upon removal.

96—*Q.—What should be the procedure when removing the parts for cleaning?* A.—Remove the vent protector from the emergency portion and apply a manufacturer's standard vent protector plug (Fig. 3) then remove the emergency portion, immediately applying the spare shipping cap and tightening the holding nuts. (As the change-over valve of the AB-8 empty and load equipment is composed of three valve portions bolted together forming a unit, mounted on a single pipe bracket face, these three portions must be handled as a unit, when transporting to and from the car). Remove the service portion and the brake pipe strainer, immediately placing the strainer in the spare shipping cap, then apply the cap to the service portion and tighten its holding nuts. Remove the cap and wasp excluder from the retaining valve and do not replace them until after cleaning as will be explained later.

97—*Q.—What should be done before remounting the valve portions on the bracket?* A.—Using the necessary scrapers, loosen any dirt in the brake pipe passages, strainer chamber and other connecting passages of the pipe bracket and then, utilizing the blower hose equipped with a nozzle (See Fig. 1 Part No. 7) remove loose dirt from the retaining valve body and pipe by blowing from both the pipe bracket and the retaining valve ends, then blow the dirt from the face of the bracket, also the strainer chamber and the branch pipe passage toward the open dirt collector. The body gaskets must be properly cleaned and inspected to note that they are in good condition, those having flattened or broken beads, cuts or cracks should be rejected. The strut cylinder must be removed from its bracket on the truck bolster and if another cylinder is not to be applied at once, the bracket ports must be protected against the entrance of dirt. The strut cylinder hose and connections must be inspected for chafing and other damage leading to failure in service. This should include the hose clamps, cap screws and clamping nuts of the flanged fittings, the pipe supporting clamps and the bolts attaching the strut cylinder to the bolster.

98—*Q.—With the service and emergency portion gaskets in place on the pipe bracket, what should now be done?* A.—Remove the shipping cap from the clean emergency portion and mount it on the bracket at once. Coat the threads with graphite grease and tighten the holding nuts evenly.

99—*Q.—What should be done with the vent protector?* A.—Clean or renew the vent protector, applying it to the cleaned emergency portion.

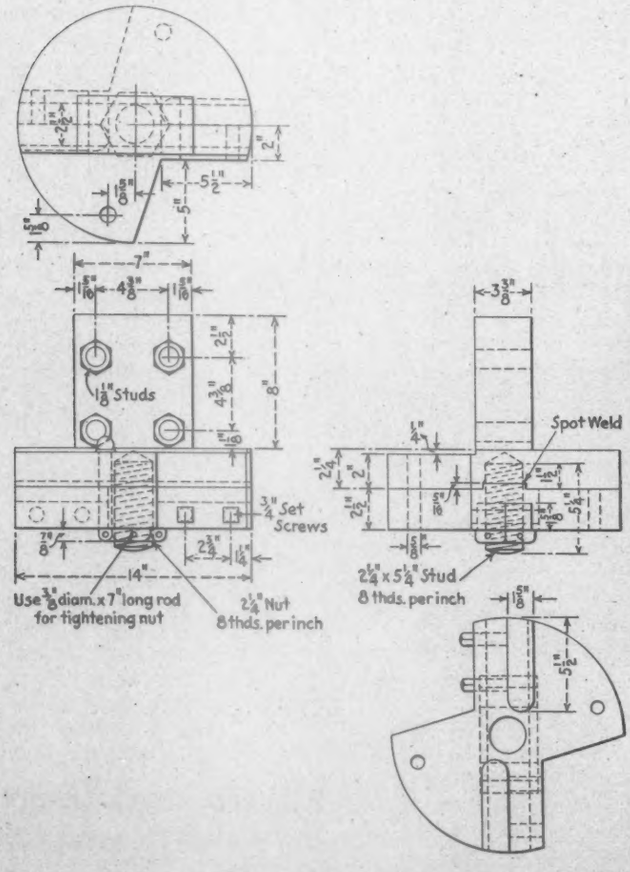
100—*Q.—What should be done next?* A.—Loosen the shipping cap on the service portion, remove the clean brake pipe strainer, and replace the shipping cap.

101—*Q.—How would you proceed to apply the strainer?* A.—Using a wood mandrel of suitable form for guiding the brake pipe strainer, place it in the pipe bracket and make sure that the inner end is in engagement with the sealing bead. Then apply the holding nut, tightening it with the special wrench provided.

Milwaukee Machine Shop Devices

Within the past year or more, a number of fine modern machine tools have been installed at the main locomotive repair shops of the Chicago, Milwaukee, St. Paul & Pacific, located at Milwaukee, Wis., and a definite effort has been made to equip these tools with the special jigs and fixtures needed for efficient handling of the various metal-removing operations. For example, on the Betts 100-in. boring mill, used for machining driving-wheel tires to fit the wheel centers, a double toolholder is used. This toolholder is shown equipped with a Vascoloy-tip tool which has just been used for roughing out the retaining ring groove. By loosening a nut underneath the toolholder, the lower part can be quickly indexed or turned through 180 deg., and the finishing tool brought into position to take the final finishing cut.

Referring to the drawing, it will be seen that this toolholder, made of billet steel, consists in the upper part of a circular plate, 14 in. in diameter by 2½ in. thick, with a section cut out on each side to accommodate the toolholder set screws and having a heavy vertical shank, 8 in. long, drilled with four holes for attachment to the boring-mill ram. This particular holder is designed for attachment to a solid ram, but may be readily made with a straight or taper shank for use on a mill having a hollow ram. The lower part of the toolholder is also made from a forged-steel plate, 14 in. in diameter by 2½ in. thick, which may be held accurately in either one of two 180-deg. positions with respect to the upper half of the holder by means of the tongue-and-groove construction indicated, and a plug or pin inserted through the desired indexing or positioning holes. The two parts of this double toolholder are held rigidly together when in use by means of a 2¼-in. stud and special hex-head nut. In boring tires with the cutting tool illustrated in this toolholder, the feed generally used is .015 in. per revolution and the surface cutting speed 176 ft. per min.

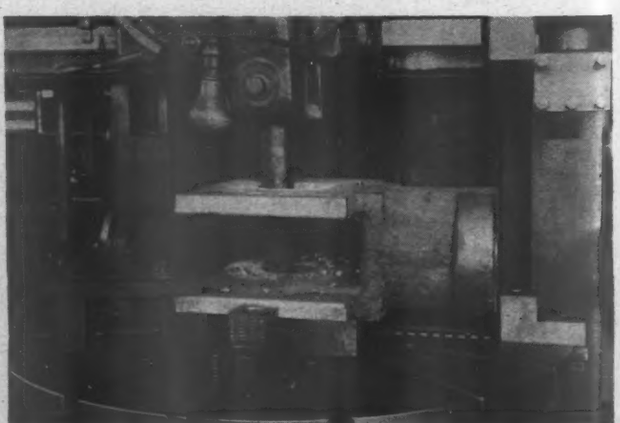


Details of special toolholder which is designed to hold a roughing and a finishing tool and may be indexed for use in either of two 180-deg. positions

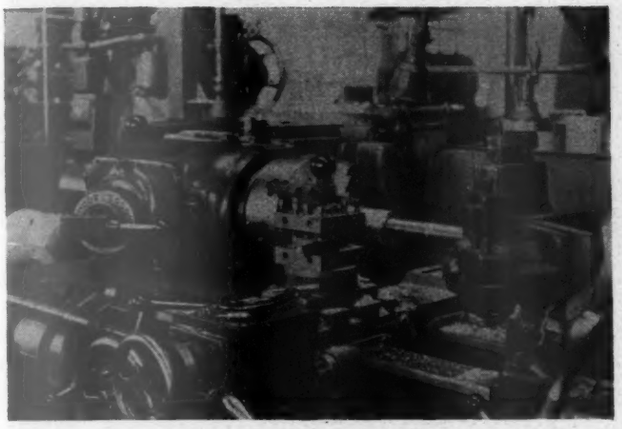
On the Jones & Lamson turret lathe, the comparatively simple operation of turning and boring brass bushings is illustrated. These bushings are designed for use in connection with engine maintenance work on gasoline-electric rail cars and are turned to 3 in. outside diameter, with a 2-in. bore. A spindle speed of 1,000 r.p.m. and feed of .007 in. per revolution are used. The speed and feed changes are quickly made and cover a wide range on this J & L turret lathe, the indexing turret head and cross-slide tool post making all cutting tools available with minimum delay.

The other two illustrations show a King 40-in. boring mill, which is giving satisfactory service for a great variety of machining operations at the Milwaukee locomotive machine shop. The particular job shown on the boring-mill table is a crosshead which is being bored and subsequently reamed for the wrist-pin fit, two machine operations which can be accurately and quickly performed on this machine. Valve-chamber bushings are also turned and bored in this machine. The special tongs used in moving these bushings to and from the boring-mill table by means of the jib crane are illus-

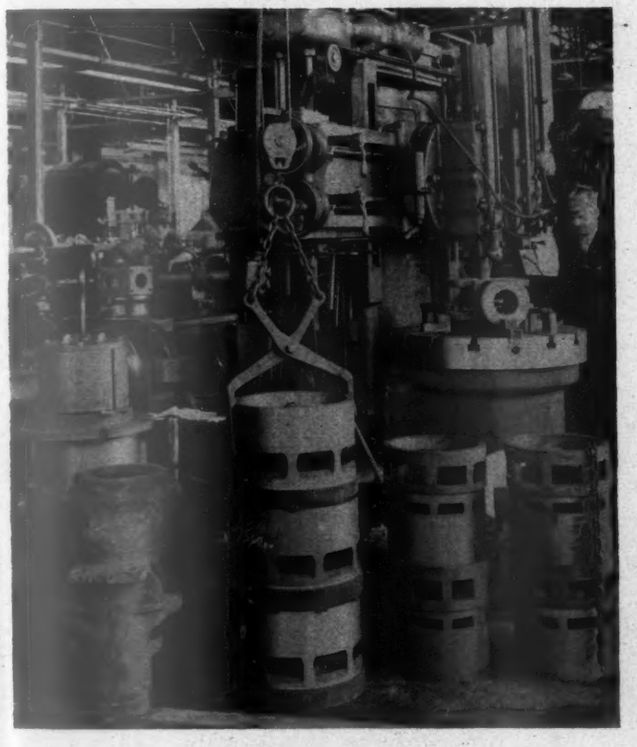
Toolholder used in boring driving-wheel tires on a Betts mill at Milwaukee shops



Cross-head set-up for boring the wrist-pin fit



J. & L. turret lathe finishing brass bushings for gasoline-engine reconditioning job



King 40-in. boring mill and some of the work which is done on it

trated. At the left of the bushings there is a special heavy semi-cylindrical steel jig with a flanged base which, when clamped on the boring mill table, greatly simplifies the setting up and holding of throttle boxes for machining the off-center hole and chamfered surfaces required for the main steam-valve seat. The box jig saves at least two hours in the set-up of this awkward piece of work. Above the throttle box in the illustration is an expanding mandrel used in the turning of main valve-packing rings.

In machining valve bushings, either 10, 12 or 14 in. in diameter, they are roughed out with all that the machine will carry, and then finished for accuracy. Special mandrels hold the bushings firmly centered on the boring-mill table. This machine has a wide range of feeds from 1/98 in. to 1/2 in. per revolution, the speed range being from 3 to 90 r.p.m. Various types of cutting tools, made with carbide and other special tool tips, are used dependent upon the kind of job being done. In general, the carbide-tip tools do not have sufficient shock resistance to perform satisfactorily in machining the ported section of the valve chambers or any similar job where the cutting is intermittent.

Locomotive Boiler Questions and Answers

By George M. Davies

(This department is for the help of those who desire assistance on locomotive boiler problems. Inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless special permission is given to do so. Our readers in the boiler shop are invited to submit their problems for solution.)

Calculating Booster Tractive Force

Q.—What additional tractive force can be obtained by applying a C-2 booster to a Pacific type locomotive having a working pressure of 225 lb.?—M. I. C.

A.—The A. A. R. formula for computing the tractive force for a locomotive booster is as follows:

$$T = \frac{C \times P \times D^2 \times S \times r}{D}$$

where

T = tractive force, lb.
C = ratio mean effective pressure in cylinder to boiler pressure and is:
- .80 for 75 per cent cut-off booster
- .73 for 50 per cent cut-off booster
- .774 for 70 per cent cut-off booster

P = boiler pressure, lb. per sq. in.
d = diameter of cylinder, in.
S = stroke of piston, in.
D = diameter of booster driving wheels, in.
r = gear ratio

Assuming that the locomotive is to be equipped with a booster having the following characteristics:

cut-off, 75 per cent
cylinder diameter, 10 in.
stroke of piston, 12 in.
gear ratio, $\frac{36}{14}$, $\frac{\text{number of teeth in axle gear}}{\text{number of teeth in crankshaft gear}}$

and the diameter of trailer wheel, 51 in.
then the tractive force of the booster would be

$$T = \frac{.80 \times 225 \times 10^2 \times 12 \times \frac{36}{14}}{51}$$

$$T = 10{,}891 \text{ lb.}$$

Use of Steel Rivets in Aluminum

Q.—Is it satisfactory to use steel rivets for fabricating aluminum cabs, runboards, etc.?—R. S. K.

A.—There is no objection to using steel rivets in aluminum cabs or runboards. The rivets can be driven hot or cold. When driven hot, the rivets should be heated to about 1,800 deg. F. and driven with as little

delay as possible so as to make the driving easier. Where a large group of hot steel rivets occur closely spaced, it is good practice to avoid overheating the adjacent metal, generally, the only precaution necessary is to drive at random rather than in succession.

The temperature of the aluminum alloy parts should not be allowed to exceed 400 deg. F. If these precautions are taken the strength of the aluminum alloy parts will not be affected appreciably and warping will be reduced to a minimum.

Steel rivets up to ¾ in. diameter have been successfully cold-driven in aluminum alloy structures. However, before driving, the rivets should be thoroughly annealed at about 1,300 deg. F. and should be cooled slowly in the furnace. Steel rivets should not be used on cabs unless they are to be painted as the rivet heads will rust.

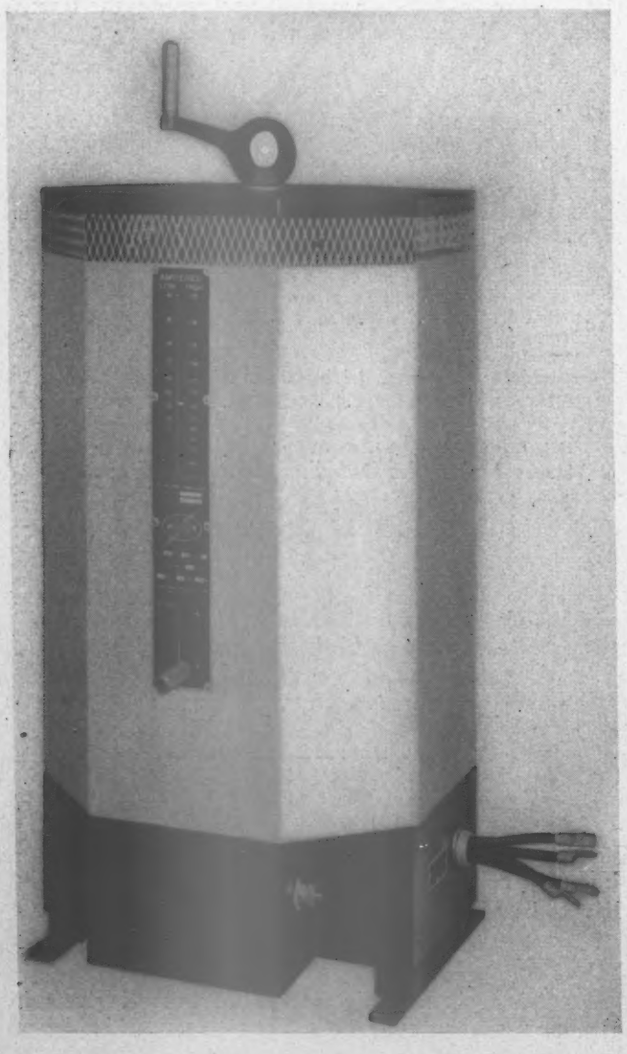
Heavy-Duty Welding Units

Self-contained ac. transformer welders of 300-, 500-, 750- and 1,000-amp. capacities have been introduced by the Wilson Welder and Metals Company, Inc., New York. They can be adapted for use on 220, 440 or 550 volts, 25- or 60-cycle current. When arranged for 220- and 440-volt operation, single phase, either voltage can be brought into use, according to the manufacturer, by a reconnection of leads which are brought outside the unit.

A wide range of current output is claimed for these welders with continuous stepless current regulation provided over the entire range by means of a hand crank on top of the machine. Construction details of the machine and the method of insulation are said to provide cooler, trouble-free operation for longer periods of time even when operating continuously at maximum settings.

Twenty-five-cycle units are all fan-cooled, 60-cycle units are fan cooled except for the 300-amp. size. All 60-cycle units have high- and low-range switches, and power-factor correction on all except the 300-amp. size. Power-factor correction is not included on the 25-cycle models and they have only one operating range.

Known as Model TW these welders are said to have operating efficiencies of from 80 to 85 per cent.



Heavy-duty welder available in a wide range of capacities

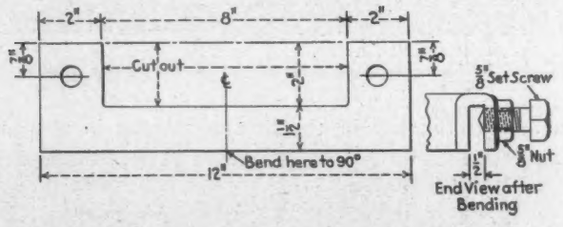
Questions and Answers On Welding Practices

(The material in this department is for the assistance of those who are interested in, or wish help on problems relating to welding practices as applied to locomotive and car maintenance. The department is open to any person who cares to submit problems for solution. All communications should bear the name and address of the writer, whose identity will not be disclosed when request is made to that effect.)

Clamp for Assembling Square Steel Boxes

Q.—I would like to have information relating to any device, such as a clamp, which can be used to hold plates when assembling steel boxes, cupboards and other square, welded articles.

A.—A handy corner clamp can be made as follows: Cut out of ⅜-in. plate a piece 12 in. long by 3½ in. wide. Then mark the center line of the 12-in. length. Mark off another line 1½ in. from one side of the piece, leaving 2 in. to the other side. From each end mark



Layout of clamp for holding corners of metal boxes square while welding

off 2 in. so that, as laid out the piece will now represent two 2-in. squares, a rectangle 1½ in. by 12 in. and another rectangle 2 in. by 8 in. Cut out this latter rectangular section, leaving two 2-in. by 2-in. ears at the end. An $1\frac{1}{16}$-in. hole is drilled at the center of each ear. The piece is now bent at the center line to exactly 90 deg. and the ears are bent over, leaving a space between the body of the clamp and each ear of about ½ in. A ⅝-in. nut is then welded over the hole in each ear and a ⅝-in. set screw turned into the nut. The clamp is now complete and to use it drop it over the

corner of the box or other article to be fabricated. It will hold the corners perfectly square while the welding is being done.

Reclaiming Inspirator Steam Valves

Q.—Near the bench where we repair inspirators is a box containing dozens of discarded forcer steam valves. These valves are all too short for use. Can they be saved?

A.—Forcer steam valves make an excellent application for the new wear-resisting bronze welding rod. There are one or two precautions that must be taken. File or grind the seat bright before attempting to build up with bronze. The operator will discover when brazing the first forcer valve that the end of the priming valve that hangs down inside the cage has a tendency to burn off. To avoid this, tear some asbestos paper into ½-in. strips and bind the end of the priming valve, this will prevent it from becoming overheated. Care should be taken when welding near the bars of the valve for these bars are light and melt very easily. Usually ½ in. to ¾ in. of new metal will be sufficient to insure a good seat, of desired height and free from pin holes.

Locomotive Design Details Improved

Constant alertness and an intimate knowledge of locomotive operating and maintenance requirements are absolutely essential if railroads are to benefit from further improvements and refinements in design of motive power details. Several examples of what can be accomplished along this line were observed in a recent visit to the Milwaukee, Wis., shops of the Chicago, Milwaukee, St. Paul & Pacific.

One instance, which might be cited, is the replacement of cast steel by built-up rolled-steel trailer caps for De Voy trailer trucks. These trailer caps are now fabricated completely by weding, and subsequently machined to bring all bearing surfaces in accurate position and alinement. The base is made of alloy billet steel and the wings of carbon boiler steel, with carborized plates welded on to resist wear on all bearing surfaces. This type of construction is said to be stronger, more wear resistant and less expensive than previous designs. The illustration shows a series of eight De Voy trailer-truck caps of the new design set up on a large planer table ready for the final machine operation.

Another interesting job was the redesign of a pair of front cylinder heads which avoided buying new ones

Front cylinder heads reclaimed by a change in design which fills up excess clearance space when new lightweight pistons are applied

A set of roller-bearing housings ready to be machined before being assembled on main locomotive driving axles

Fabricated De Voy trailer-truck caps set up on a planer ready for machining

when new lightweight rods and pistons were applied to a locomotive. These cylinder heads were reclaimed by building them up so as to fill the additional clearance space provided by the new piston design. Conical extension plates were simply formed in a die and welded to the old cylinder head. These heads were then reapplied to the locomotive and are now giving excellent service.

Another slight change in practice, made possible by the use of the mechanical gas-cutting machine and designed simply to facilitate doing more accurate work in the machine shop, is shown in one of the illustrations. All that was done in this case was simply to leave a small section of metal at the extreme end of the radius bar, so as to tie together the sides of the long clevis section and hold them in accurate alinement while the clevis is being machined and the link pin holes bored and reamed. Without this tie, it is necessary to apply blocking which may not always be easily held in place and without which there is sufficient spring in the sides of the clevis so that it is difficult to do the machine work with accuracy and smoothness. With the present arrangement, as soon as the machine operations on the clevis end of the radius bar are finished, the end ties are cut out and the radius bar completed to blueprint.

Another illustration shows a set of four roller bearing housings for locomotive main driving axles, mounted on skids and ready to be machined for application of the roller-bearing units.

Ties left in radius-bar ends during machining operations promote accuracy and smoother work

Fabricating All Steel Front End Parts by Welding

The construction of a welded steel stack is simple, in fact a boilermaker and helper without any special equipment can cut, roll and prepare for welding the entire assembly in about seven hours. The welding takes even less time than this.

The body of the stack is made from 3/8-in. tank steel and is rolled in one piece, the taper varies slightly with the different types of locomotives but is generally about 1 in. in 12 in. The smoke-stack flange is torch cut to

The completed ring blower, before drilling

size, its diameter being about 10 in. larger than the diameter of the stack. The flange is rolled to the curve of the smoke box, the center or smoke stack fit is then cut out with the torch. The flange is located in its proper position on the stack and tacked in place. A piece of 1½-in. half oval stock is rolled into a circle to fit the top of the stack and this is tacked in place. All that is needed to complete the stack is to weld on the four pieces of 2-in. angle iron that are used to hold the stack and petticoat together in the smoke box.

The petticoat, or draft pipe, is a little more difficult to roll due to its abrupt taper. The method used with the best results and the greatest accuracy being to use ordinates spaced a couple of inches apart and keeping them parallel with the rolls at all times during the

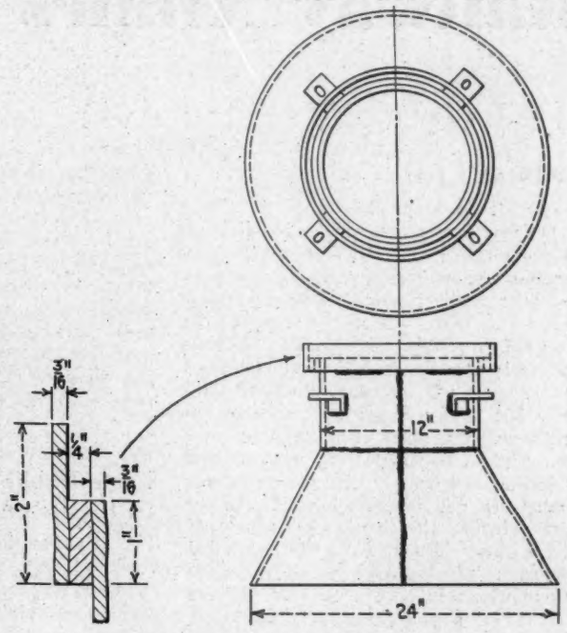
A locomotive stack fabricated by welding

rolling. After the skirt of the extension is rolled, the top is rolled to fit and tacked to the skirt. Two pieces of band iron are needed for the joint at the top of the petticoat, one piece of 3/16-in. by 2-in. and one piece ¼-in. by 1-in., these pieces are rolled and welded to the top to make a guide for the bottom of the stack when lining them in position.

Many front ends are so constructed that it becomes necessary to remove part of the skirt of the draft pipe because of the lack of space between the back plates and the stack. When this condition exists, the needed amount is torch cut from the skirt and a flat plate substituted. Four pieces of 2-in. angle with slots in them are welded to the pipe the same as the stack and these bolting lugs are slotted to take a ¾-in. bolt and are welded all around.

Another example of fabricated steel replacing cast iron is found in the all-welded steel exhaust-tip ring blower. The construction of the part embodies simple shearing, rolling and welding technique.

The base is a square of ½-in. boiler plate made the same outside dimensions as the top of the exhaust base. The center of this plate is flame cut to a diameter 13/16 in. larger than the desired inside measurement of the tip. A strip of ⅜-in. plate is rolled to the proper inside diameter and taper according to print. This is assembled in the opening of the base piece leaving enough protruding through the bottom to machine a suitable seat. It is then welded. A ring is rolled and welded



Details of the welded draft pipe

together to form the outside of the tip. This ring is made from ¼-in plate, spaced equidistant, and welded inside and out. The ring for the top is sheared or flame cut to size, laid in place and welded securely.

Four triangular pieces are welded to the top of the tip to create pockets in the exhaust to entrap the front-end gases. A 1½-in. pipe nipple is welded to the side of the tip as a steam inlet. The blower is completed with eight 3/16-in. holes drilled in the top. The completed tip is taken to a lathe where the seat is faced off square with the base. When the bolt holes are drilled the all-welded tip is ready to be placed in service. With the steel exhaust tip it is a simple matter to decrease or increase the size of the tip.

The completed stack and draft pipe

High Spots in

Railway Affairs . . .

Eastman's Job

Joseph B. Eastman, director of the Office of Defense Transportation, is building up his organization and is going steadily forward in trying to remove handicaps from the paths of the common carriers in their efforts to more effectively handle the heavy defense and war traffic. He has made it quite plain on several occasions that he does not intend to interfere with them, but rather hopes to co-operate in such a way that their efforts can be more intelligently co-ordinated, to the end that production and orderly distribution in this country be not interfered with. In an address before the National Council of Private Motor Truck Owners he made this statement: "Fortunately we all have the same aim, namely, to win the war. I have received most gratifying and unanimous offers of co-operation on the part of both carriers and shippers, including the government agencies. I have every expectation that they will make good on those offers."

Public Aid to Carriers

One of the most disturbing elements in the problem of fair regulation of competing common carriers by the government is the extent to which they are given public aid and just who profits from some of the subsidies or aids that are extended to particular classes of carriers. The Board of Investigation and Research created by the Transportation Act of 1940, and which will die next September unless its life is extended by the President, has announced that a study will be made on public aids to the railways, highways and waterways. This it is said, will be closely related to the recently announced tax study. "Insofar as possible and to the extent practicable within the time allotted for the study," says the announcement, "an effort will be made to subdivide the public aids to each kind of transport by regions, and by distinguishable groups of users. Since it is important as a guide to public policy that the benefits realized or believed to have been realized from public aids be thoroughly analyzed, the projected study, in addition to estimating the extent of the aids, will inquire as fully and as specifically as possible into the benefits."

Pilfering on Trains

The Railway Gazette of London publishes a column summarizing answers to questions asked in Parliament affecting transportation. One of these related to the stealing of towels on trains. Col. J. J. Llewellin, joint Parliamentary secretary, Ministry of War Transport, made this reply: "Precise information is not available, but I am told that the loss of towels, soap, etc., through pilferage is large. The difficulty in obtaining replacements has resulted in the curtailing of the supply of these articles on trains, and if pilfering continues it may become impossible for the railways to continue to provide these requirements."

Urges Public Ownership Of Rights of Way

The fact that the railroads own their own rights of way, while other types of carriers operate over rights of way furnished and maintained by the government, has made the problem of treating them on an equitable basis exceedingly difficult. The National Resources Planning Board has been making studies of a rather ambitious nature, with a view to stabilizing economic conditions in post-war years. Its plans, apparently, include great public works projects and the extensive rebuilding or reorganization of facilities in cities. Through its Transportation Section it has just made a report on transportation problems and future development. The President has transmitted this to Congress. The report urges government ownership of all rights of way of transportation agencies and points out that because the railroads, unlike other agencies, now own their own rights of way, "both the planning of an overall transportation system and the profitable investment of public capital are thwarted; and exclusion of the railroads from a large-scale public works program accentuates the problem of unequal promotional policies, hence an uneconomic distribution of traffic."

Co-operation from Shippers

One of the outstanding developments over the past two decades has been the cultivation of better relations and more intelligent co-operation between the shippers and the railroads. The remarkable success which the railways are having in handling the present heavy traffic is due in no small part to this fact. In a way it is reflected in a reply made by Joseph B. Eastman to a question asked by Representative Houston in a recent hearing before a subcommittee of the House Appropriation Committee. The Congressman suggested that the railroads might speed up the unloading of freight cars by increasing the demurrage charges. In reply Mr. Eastman expressed the opinion that the railroads could get more help from the shippers in car utilization by their voluntary co-operation than by further penalizing demurrage.

Ten Per Cent Fare Increase

The Interstate Commerce Commission moved at a fast pace after closing the rate hearings. On January 21 it granted the railroads and certain water carriers authority on 10 days' notice to increase their passenger fares approximately 10 per cent. This was done on the basis of increased wages to employees, increased cost of materials and supplies, and additional expenditures to safeguard their properties and operations during the present emergency. This increase does not affect fares specially published for application to members of military or naval forces of the United States on furlough, nor does it affect fares published as extra fares, applicable in connection with transportation on particular trains. It is expected that the Commission will shortly grant an increase in freight rates. That problem, however, is not so simple as that of adjusting passenger rates, which can more readily be done on a flat percentage basis.

Non-Defense Spending Should be Drastically Cut

The nation was heartened near the close of the year by the report of the Joint Congressional Committee on the Reduction of Non-Essential Federal Expenditures, under the chairmanship of Senator Byrd of Virginia. It recommended drastic cuts in non-defense federal activities. At about the same time the Brookings Institute released a report, suggesting the reduction of such expenditures by more than two billion dollars, and this without affecting essential social services. "The government can set an example for the people in this critical hour," says the Brookings study, "by practicing the rigid economies which the national situation imperatively requires. Although non-essential private construction which is already under way is being abandoned, so that men and materials will be available for the war effort, much federal non-defense construction is still proceeding." The study suggests that flood control, rivers and harbors, and other waterway projects could be cut by $350,000,000 and highway development by $171,000,000. There is also pending in Congress a Rivers and Harbors Bill which would authorize construction of non-defense public works costing very nearly $1,000,000.

Among the Clubs and Associations

NORTHWEST CAR MEN'S ASSOCIATION.—Meeting February 2, 8 p. m., at The Midway Club, St. Paul, Minn. Discussion of proposed changes in A. A. R. Rules of Interchange.

NORTHWEST LOCOMOTIVE ASSOCIATION.—Meeting February 16, 8 p. m., Woodruff Hall, St. Paul, Minn. Safety night. Speakers: Safety superintendents of northwest railroads.

ANTHRACITE VALLEY CAR FOREMEN'S ASSOCIATION.—Meeting February 16, 6:30 p. m., Hotel Redington, Wilkes-Barre, Pa. Discussion 1942 A. A. R. Book of Rules. Entertainment.

WESTERN RAILWAY CLUB. — Meeting February 2, 8 p. m., Hotel Sherman, Chicago. Speaker: Jos. E. Barzynski, Brigadier General, Q. M. C., Chicago. Subject: Defense for America! Motion picture talkie.

CANADIAN RAILWAY CLUB.—Meeting February 9, 8:15 p. m., Windsor Hotel, Montreal, Que. Speaker: J. C. Long, western sales manager, Franklin Railway Supply Co., Inc., Chicago. Subject: Franklin steam distribution system with O. C. poppet valves.

NEW ENGLAND RAILWAY CLUB.—Meeting February 10, 6:30 p. m., Hotel Touraine, Boston, Mass. Speaker: Leicester S. Johnston, Major, Chemical Warfare Service, United States Army. Subject: Function of Air Raid Precaution Services.

CAR DEPARTMENT ASSOCIATION OF ST. LOUIS.—Meeting February 17, at 8 p. m., at the Hotel DeSoto, St. Louis, Mo. Speaker: R. K. Betts, general car foreman, Pennsylvania. Subject: "How the Carmen Can Help Keep Them Rolling."

DIRECTORY

The following list gives names of secretaries, dates of next regular meetings, and places of meetings of mechanical associations and railroad clubs:

ALLIED RAILWAY SUPPLY ASSOCIATION.—J. F. Gettrust, P. O. Box 5522, Chicago.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—C. E. Davies, 29 West Thirty-ninth street, New York. Annual meeting Hotel Astor, New York, December 1-5.

RAILROAD DIVISION.—E. L. Woodward, *Railway Mechanical Engineer*, 105 West Adams street, Chicago.

ANTHRACITE VALLEY CAR FOREMEN'S ASSN.—Frank Kramer, 412 Hill street, Duryea, Pa. Meets third Monday of each month at Wilkes-Barre, Pa.

ASSOCIATION OF AMERICAN RAILROADS.—Charles H. Buford, vice-president Operations and Maintenance Department, Transportation Building, Washington, D. C.

OPERATING SECTION.—J. C. Caviston, 30 Vesey street, New York.

MECHANICAL DIVISION.—A. C. Browning, 59 East Van Buren street, Chicago.

PURCHASES AND STORES DIVISION.—W. J. Farrell, 30 Vesey street, New York.

MOTOR TRANSPORT DIVISION.—George M. Campbell, Transportation Building, Washington, D. C.

CANADIAN RAILWAY CLUB.—C. R. Crook, 4415 Marcill avenue, N. D. G., Montreal, Que. Regular meetings, second Monday of each month, except June, July and August, at Windsor Hotel, Montreal, Que.

CAR DEPARTMENT ASSOCIATION OF ST. LOUIS.—J. J. Sheehan, 1101 Missouri Pacific Bldg., St. Louis, Mo. Regular monthly meetings third Tuesday of each month, except June, July and August, DeSoto Hotel, St. Louis.

CAR DEPARMENT OFFICERS' ASSOCIATION.—Frank Kartheiser, chief clerk, Mechanical Dept., C. B. & Q., Chicago.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—G. K. Oliver, 8238 S. Campbell avenue, Chicago. Regular meetings, second Monday in each month, except June, July and August, La Salle Hotel, Chicago.

CAR FOREMEN'S ASSOCIATION OF OMAHA, COUNCIL BLUFFS AND SOUTH OMAHA INTERCHANGE.—H. E. Moran, Chicago Great Western, Council Bluffs, Ia. Regular meetings, second Thursday of each month.

CENTRAL RAILWAY CLUB OF BUFFALO.—Mrs. M. D. Reed, Room 1840-2, Hotel Statler, Buffalo, N. Y. Regular meetings, second Thursday of each month, except June, July and August, at Hotel Statler, Buffalo.

EASTERN CAR FOREMAN'S ASSOCIATION.—W. P. Dizard, 30 Church street, New York. Regular meetings, second Friday of January, February (annual dinner), March, April, May, October, and November at Engineering Societies Bldg., 29 West Thirty-ninth street, New York.

INDIANAPOLIS CAR INSPECTION ASSOCIATION.—R. A. Singleton, 822 Big Four Building, Indianapolis, Ind. Regular meetings, first Monday of each month, except July, August and September, in Indianapolis Union Station, Indianapolis, at 7 p. m.

LOCOMOTIVE MAINTENANCE OFFICERS' ASSOCIATION.—Secretary-treasurer C. M. Lipscomb, Missouri Pacific, North Little Rock, Ark.

MASTER BOILER MAKERS' ASSOCIATION.—A. F. Stiglmeier, secretary, 29 Parkwood street, Albany, N. Y.

MID-WEST AIR BRAKE CLUB.—C. F. Davidson, secretary-treasurer, general inspector car department, St. L.-S. F., Springfield, Mo.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic avenue, Boston, Mass. Regular meetings second Tuesday in each month, except June, July, August and September.

NEW YORK RAILROAD CLUB.—D. W. Pye, Room 527, 30 Church street, New York. Meetings, third Thursday in each month, except June, July, August, September and December at 29 West Thirty-ninth street, New York.

NORTHWEST CAR MEN'S ASSOCIATION.—E. N. Myers, chief interchange inspector, Minnesota Transfer Railway, St. Paul, Minn. Meetings first Monday each month, except June, July and August, at Midway Club rooms, 1931 University avenue, St. Paul.

NORTHWEST LOCOMOTIVE ASSOCIATION.—G. T. Gardell, 820 Northern Pacific Building, St. Paul, Minn. Meetings third Monday of each month, except June, July and August.

PACIFIC RAILWAY CLUB.—William S. Wollner, P. O. Box 3275, San Francisco, Cal. Monthly meetings alternately in northern and southern California.

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, 1647 Oliver Building, Pittsburgh, Pa. Regular meetings, fourth Thursday in month except June, July and August, Fort Pitt Hotel, Pittsburgh, Pa.

RAILWAY FUEL AND TRAVELING ENGINEERS' ASSOCIATION.—T. Duff Smith, Room 811, Utilities Building, 327 South La Salle street, Chicago.

RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION.—J. D. Conway, 1941 Oliver Building, Pittsburgh, Pa.

SOUTHERN AND SOUTHWESTERN RAILWAY CLUB.—A. T. Miller, P. O. Box 1205, Atlanta, Ga. Regular meetings, third Thursday in January, March, May, July and September. Annual meeting, third Thursday in November, Ansley Hotel, Atlanta, Ga.

TORONTO RAILWAY CLUB.—D. M. George, Box 8, Terminal A, Toronto, Ont. Meetings, fourth Monday of each month, except June, July, and August at, Royal York Hotel, Toronto.

WESTERN RAILWAY CLUB.—E. E. Thulin, executive secretary, Room 822, 310 South Michigan avenue, Chicago. Regular meetings, third Monday in each month, except June, July, August, September, and January.

* * *

A 44-ton Diesel-electric switcher built by General-Electric and powered by two Caterpillar engines handling cars on the Boston & Maine

NEWS

Railroad Estimates of 1942 Steel Needs

ESTIMATES of the requirements of the railroads and car and locomotive builders during the twelve months of 1942 have been revised by the roads and submitted to the Office of Defense Transportation. The figures, made available after a meeting of the Special Purchasing Committee of the Purchases and Stores Division, A. A. R., held in Washington, D. C., on Wednesday, January 21, had been requested by Director Joseph B. Eastman.

The estimates of the steel required by the railways and equipment builders include the materials previously estimated for the program of 36,000 freight cars to be built by May 1, in addition to the 9,000 which were expected to be built during January; these are included with 121,827 freight cars and 974 locomotives which it is now proposed to build before the end of the year. This includes 29,046 cars to be built in railroad shops and 62,781 cars to be built in the shops of equipment builders and delivered by October 1, and 30,000 cars to be built in railroad and contract shops for delivery between October 1 and the end of the year. The locomotives include 364 steam, 558 Diesel-electrics, 33 electrics, and 19 other types. The iron and steel products required for this program are set forth in the table which is shown below.

"Unfinished Rainbows"

A NEW technicolor sound movie, produced by the Wilding Picture Productions, Inc., in both 16- and 35-mm., for the Aluminum Corporation of America, Pittsburgh, Pa., is a dramatization of the history of the aluminum industry in America. It is presented as an example of what may be accomplished when "unfinished rainbows" are tackled with the courage and determination displayed by Charles Martin Hall in his woodshed laboratory and by the early leaders in the industry which followed the development of the electrolytic process for the production of aluminum. It dramatizes the struggles of the industry to develop markets for the material and is brought up to date by a presentation of the defense efforts now being made by the producers of the metal.

Throughout, the film implies that there are other "unfinished rainbows" awaiting the youth of today who have the requisite vision and persistence.

Eastman Appoints Division Heads of ODT

ON January 8, January 14 and January 16 Joseph B. Eastman, director of the Office of Defense Transportation, announced the appointments of a number of division directors and other assistants. The newly appointed division heads and assistants are:

Division of	Headed by
Railway Transport	Victor V. Boatner, director; formerly president of the Chicago Great Western.
Motor Transport	John L. Rogers, director; member I. C. C.
Traffic Movement	John R. Turney, director; formerly vice-president law and traffic, St. Louis-South Western.
	Henry F. McCarthy, associate director; passenger traffic manager, Boston & Maine.
	Samuel W. Fordyce, assistant director, to head the Section of War Traffic; assistant to the president, K. C. S.
	Walter Bockstahler, assistant director, to head the Section of Traffic Channels; formerly vice-president Keeshin Freight Lines.

(Continued on next left-hand page)

Iron and Steel Products to Be Acquired Through Purchase for Delivery During 1942 for Railroads, Car Builders and Locomotive Builders—Net Tons

	Plates, shapes, bar, sheets, billets, roofs, doors, ends, fabricated and pressed steel parts, etc.	Side Frames	Bolsters	Couplers and Yokes	Draft Gears	Other Castings	Axles	Loco. Tires	Wheels One Wear	Wheels Multi-Wear	Crank Pins	Piston Rods	Other Forings	Bolts, nuts, washer, tubes, flues pipe, nails, springs, etc.
Railroad Maintenance ...	847,418	31,447	14,465	54,600	36,934	103,782	43,524	57,893	24,802	85,401	5,983	2,372	26,605	265,877
New Cars For Delivery to October 1, 1942														
Railroad Shops	306,891	30,850	21,679	17,829	7,781	18,812	43,901	141	25,638	12,642	....	....	3,938	25,367
Car Builders.	536,104	56,209	37,014	28,867	14,879	16,908	83,647	....	24,307	....	....	....	31,141	32,463
For Delivery October to December, 1942	354,780	38,400	25,500	19,200	10,500	15,750	52,530	....	18,360	....	....	....	16,170	24,300
New Locomotives..	77,337	....	....	740	254	75,417	6,723	32,531	....	6,583	566	290	9,790	20,298
Grand Total....	2,122,530	156,906	98,658	121,236	70,348	230,669	230,325	90,565	93,107	104,626	6,549	2,662	87,664	368,305

	Rail (Net Tons)	Track Fastenings	Frogs and switches guard rails, etc.	Steel for bridges, buildings, etc.	Grey Iron Castings	Malleable Castings	Pig Iron	Scrap Iron & Steel	Grand Total
Railroad Maintenance.....	1,632,394	887,883	103,262	137,046	33,812	14,125	10,979	4,028	4,424,632
New Cars For Delivery to October 1, 1942									
Railroad Shops	.....	.....	.....	.....	197	975	6	....	516,647
Car Builders	.....	.....	.....	.....	....	....	....	....	861,539
For Delivery October to December, 1942	.....	.....	.....	.....	....	....	....	....	575,490
New Locomotives	.....	.....	.....	.....	3,490	786	....	....	234,805
Grand Total	1,632,394	887,883	103,262	137,046	37,499	15,886	10,985	4,028	6,613,113

Carry the Whole Load on CHILLED CAR WHEELS

PRODUCTION CAPACITY OF 3,700,000 AMPLE FOR ALL NEEDS . . .

Chilled Wheel Foundry facilities *now available* provide manufacturing facilities sufficient for all replacement needs and for the equipment of 187,000 new freight cars each year as well.

48 strategically located foundries in the United States and Canada simplify stores and transportation problems while the unique exchange plan makes Chilled Wheels cost less.

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ORGANIZED TO ACHIEVE:
Uniform Specifications
Uniform Inspection
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Rates	G. Lloyd Wilson, director; professor of transportation and public utilities, University of Pennsylvania.
Transport Personnel	Otto S. Beyer, director; member of the National Mediation Board.
Storage	Leo M. Nicholson, director; Chicago real estate and warehouse operator.
Local Transport	Guy A. Richardson, director; former president of the Chicago Surface Lines and receiver for the Chicago Railways Co.
Inland Waterway Transport	Edward Clemens, director; vice-president, Mississippi Valley Barge Line.
Section of Materials and Equipment	Col. C. D. Young, director, vice-president in charge of real estate, purchases, and maintenance, Pennsylvania.

Other appointments made by Mr. Eastman are: Executive assistant: Joseph L. White, consultant on transportation problems; General counsel: Jack G. Scott, chief of the Legal and Enforcement Section of the I. C. C. Bureau of Motor Carriers; Assistant on pipe lines, tankers, tank cars, and tank trucks: Fayette B. Dow; Assistant on Great Lakes Carriers: A. T. Wood.

The Section on Materials and Equipment, of which Colonel Young is head, was created, Mr. Eastman said, because of the direction of the president that ODT "stimulate the provision of necessary additional transport facilities and equipment in order to achieve the level of domestic transportation service required." Mr. Eastman explained that he had called the organization of which Colonel Young is head "a section, instead of a division, because it will supply the staff work on materials and equipment for my carrier divisions, but Colonel Young will report directly to me."

In his first press conference on January 8 Mr. Eastman said that the greatest danger he now foresees is that the carriers may not be able to get materials for new equipment and repairs. That "looms up as a special danger to the automotive branch of the industry," although "it applies to all." Mr. Eastman foresees that there may be a tendency not to realize that "commercial and civil transportation is an integral part of the defense mechanism." Efficient transportation, he insisted, "is just as important to war production as machine tools; if transportation should bog down, that would be reflected immediately in the war effort."

Nelson Heads War Production Board

APPOINTMENT of a War Production Board with Donald M. Nelson as chairman was announced by President Roosevelt on January 13. The new board, the announcement said, "will be granted the powers now exercised by the Supply Priorities and Allocations Board, and Mr. Nelson in addition to being chairman, "will be charged with the direction of the production program and will have general supervision over all production agencies"; his decision "as to questions of procurement and production will be final."

A Million Loadings by May

ESTIMATING that weekly carloadings will reach a level of about one million cars as early as May this year, the Supply Priorities and Allocations Board early in January authorized the Office of Production Management to grant priorities for the construction by that time of 36,000 freight cars, in addition to the 9,000 which were expected to be built during January. The program was recommended by Leon Henderson, director of OPM's Division of Civilian Supply, and Joseph B. Eastman, director of the Office of Defense Transportation; and, as SPAB sees it, the cars thus provided would "just permit the roads to meet this peak at full operating efficiency."

As to locomotives, OPM was authorized to grant priorities for the continued production through April of locomotives "now on order or now scheduled for production for stock, consisting of 248 steam locomotives, 58 electric locomotives, and 620 Diesel locomotives."

In the freight car program preference will be given "to types needed to transport military equipment"; while the locomotive program provides that those built for stock "be of a type and size suitable for military or foreign use, and that Diesel locomotive production must not interfere with deliveries of Diesel engine crankshafts for military use."

Orders and Inquiries for New Equipment Placed Since the Closing of the January Issue

LOCOMOTIVE ORDERS

Road	No. of Locos.	Type of Locos.	Builder
Chesapeake & Ohio	15[1]	0-8-0	Lima Loco. Works
Chilean Nitrate Sales Corp.	8	40-ton Diesel-elec.	General Elec. Co.
National Steel Co. of Brazil[2]	2	2-8-2	H. K. Porter Co.
	4	0-6-0	
	3	0-4-0	
Sanderson & Porter Co.	2	45-ton Diesel-elec.	General Elec. Co.
Southern	2	5,400-hp. Diesel-elec. frt.	Electro-Motive Corp.
Stone & Webster Co.	1	80-ton Diesel-elec.	General Elec. Co.
Wabash	1	1,000-hp. Diesel-elec.	Baldwin Loco. Wks.

LOCOMOTIVE INQUIRIES

Road	No. of Locos.	Type of Locos.	Builder
Argentine State Rys.	10-15	4-6-2	.....
New York Central	25	4-8-2	.....
Petroleos Mexicanos	2	2-8-2	.....

FREIGHT-CAR ORDERS

Road	No. of Cars	Type of Cars	Builder
Atlantic Coast Line	1,100	50-ton box	Pullman-Std. Car Mfg. Co.
	400	50-ton hopper	Bethlehem Steel Co.
	300	50-ton gondola	
	100	70-ton covered phosphate	
	100	50-ton flat	Greenville Steel Car Co.
Chesapeake & Ohio	1,000[3]	50-ton hopper	American Car & Fdry. Co.
Louisville & Nashville	750	50-ton hopper	American Car & Fdry. Co.
	500	50-ton box	
	100	70-ton covered hopper	
	400	50-ton box	Pullman Std. Car Mfg. Co.
	750	50-ton hopper	
	100	50-ton box	
	225[4]	50-ton box	
	500	50-ton hopper	Pressed Steel Car Co.
	100	50-ton flat	Mt. Vernon Car Mfg. Co.
Pittsburgh & West Virginia	100	50-ton box	Company shops

FREIGHT-CAR INQUIRIES

Road	No. of Cars	Type of Cars	Builder
Argentine State Rys.	50	9,500-gal. tank	.....
Baltimore & Ohio[5]	1,000	50-ton box	.....
	1,000	50-ton hopper	.....
Chicago & North Western[5]	1,000	50-ton gondolas	.....
	500	50-ton box	.....
	250	50-ton flat	.....
	25	50-ton cement	.....
Chicago, Rock Island & Pacific	300	50-ton auto-box	.....
	300	50-ton flat	.....
	150	50-ton hopper	.....
	25	70-ton covered hopper	.....
Detroit, Toledo & Ohio	50	50-ton flat	.....
	70	50-70-ton gondola	.....
Grand Trunk Western	200	40-ton box	.....
New York, Chicago & St. Louis	25	Caboose	.....
Pere Marquette	250	70-ton flat	.....
Southern	2,500	50-ton hopper	.....
	1,000	50-ton gondola	.....

[1] Cost approximately $1,257,000.
[2] Order unconfirmed.
[3] Reported cost, $2,560,000.
[4] For the Atlanta & West Point.
[5] Inquiry unconfirmed.

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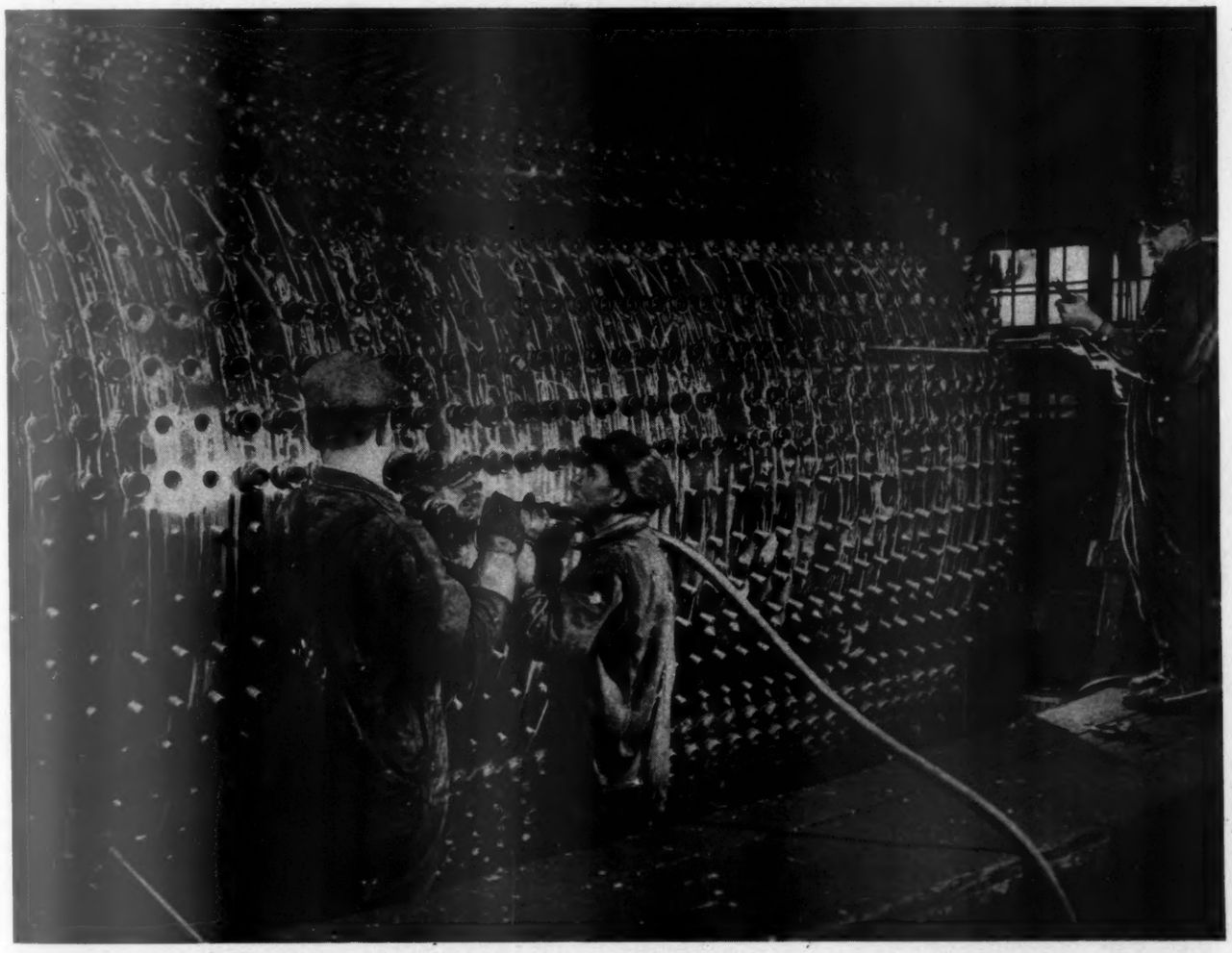
Care in Staybolt Application

has an important bearing on future locomotive maintenance



At Lima particular attention is paid to the application of staybolts. This care, which typifies Lima's attitude toward each step in the construction of a locomotive, is one of the reasons that Lima locomotives have earned for themselves the reputation of being well-built, low maintenance locomotives. Supplement your present power with NEW, modern, high-speed locomotives of the type that Lima has recently built to aid the railroads in speedy handling of the increased traffic.

LIMA LOCOMOTIVE WORKS LIMA LOCOMOTIVE WORKS INCORPORATED **INCORPORATED, LIMA, OHIO**

Nelson Announces WPB Organization; OPM Abolished

REORGANIZATION of the government's war production set-up, involving abolition of the Office of Production Management, was announced on January 21 by Donald M. Nelson, chairman of the new War Production Board created by President Roosevelt in an executive order signed January 16. WPB also supplants the Supply Priorities and Allocations Board, although the former SPAB members continue as WPB members.

Railroad requirements for materials will continue to be handled through a Civilian Supply Division, which, like its OPM predecessor, will be headed by Leon Henderson. However, Mr. Nelson said that "we must keep the transportation system sound, and moving the goods; if we don't, and transportation breaks down, the program breaks down."

Mr. Nelson's organization has six major divisions. Their names and chiefs are as follows: Purchases, Douglas MacKeachie; Production, W. H. Harrison; Materials, William L. Batt; Industry Operations, J. S. Knowlson; Labor, Sidney Hillman; Civilian Supply, Leon Henderson. Priorities, formerly handled in the OPM Priorities Division, will now be handled in the Division of Industry Operations. Also, Mr. Nelson has set up a Requirements Committee, headed by Mr. Batt, which will handle the allocation of raw materials; and a planning unit which, as the WPB chairman put it, "will think through how the job can be done better."

80,502 Freight Cars, 633 Locomotives Installed in 1941

CLASS I railroads in 1941 put 80,502 new freight cars in service, the largest number installed in any year since 1929, according to the Association of American Railroads. This was an increase of 14,957 compared with the number of new freight cars put in service in 1940; in 1929, the railroads installed 84,894 new freight cars.

New freight cars installed in 1941 included 44,807 box, 30,938 coal, 1,752 flat, 2,200 refrigerator, 149 stock and 656 miscellaneous cars. Class I railroads on January 1, 1942, had 74,897 new freight cars on order, "the largest number at the beginning of any year since the compilation of these records began 20 years ago." New freight cars on order on January 1, 1941, totaled 35,702. New freight cars on order at the beginning of this year included 46,300 box, 23,638 coal, 1,400 refrigerator, 2,191 flat, 300 stock and 1,068 miscellaneous cars.

New locomotives installed in service in 1941 by the Class I roads totaled 633, of which 161 were steam and 472 were electric and Diesel-electric. This was the largest number put in operation since 1930. In 1940, there were 419 new locomotives put in service, of which 126 were steam and 293 were electric and Diesel-electric.

New locomotives on order on January 1, 1942, totaled 546, which included 258 steam and 288 electric and Diesel-electric. On January 1, 1941, there were 206 on order, of which 115 were steam and 91 were electric and Diesel.

Equipment Purchasing and Modernization Programs

Chicago & North Western.—A contract has been awarded the T. S. Leake Construction Company, Chicago, for the construction of a machine-shop addition to the enginehouse at Proviso yards, Proviso, Ill., for servicing large locomotives. The addition will be approximately 50 ft. by 75 ft. in size, of brick and steel construction.

Northern Pacific.—The Northern Pacific has asked the Interstate Commerce Commission for authority to assume liability for $1,800,000 of equipment trust certificates, maturing in 10 equal annual installments of $180,000 on February 16, in each of the years from 1943 to 1952, inclusive. The proceeds will be used as part of the purchase price of new equipment costing a total of $2,275,000 and consisting of 500 70-ton, all-steel, Hart Selective ballast cars; four 1,000-hp. Diesel-electric switching locomotives, and two 660-hp. Diesel-electric switching locomotives.

Springfield & Southwestern.—This newly-formed company has asked Interstate Commerce Commission authority to issue 50 shares of common capital stock of a par value of $100 and 10 unsecured notes aggregating $55,000. The notes will bear interest at the rate of five per cent, will mature on December 31 in each of the years from 1947 to 1951, inclusive, and the funds will be used to purchase rolling stock and equipment of the Chicago, Springfield & St. Louis in Springfield, Ill.

Union Pacific.—Additional enginehouse facilities are being constructed at Green River, Wyo., at a cost of approximately $144,000. The work includes the construction of one additional engine stall 178 ft. in length, the lengthening of two existing stalls to 178 ft., the extension of five other stalls to make them 156 ft. long, and the installation of a 75-ton electric drop table and pit extending across three stalls to replace the present drop table and pits. A contract amounting to $80,000 has been awarded the James Leck Company, Minneapolis, Minn., in connection with this work.

Wabash.—The Wabash has been authorized by the district court to spend $1,315,223 for the maintenance of right of way and additions and betterments. Included are $489,509 for the purchase of new freight cars and the rehabilitation of 150 old ones.

75 Percent of 1942 Equipment Already on Order—Pelley

ON January 6 at Chicago, J. J. Pelley, president of the Association of American Railroads, declared that 85,000, or 75 per cent of the 113,000 freight cars which the railways have committed themselves to buy in 1942, were then on order and added that 9,000 of these cars would be delivered in January, 10,500 in February, and 12,500 during March.

Concerning locomotive deliveries, he said that these would be somewhat slower but that 1,000 units are on order and these should be delivered in ample time for requirements. Of the 1,000 units on order, he said that 630 are steam for main-line service and the remainder are Diesel-electric, mostly for yard and switching service.

* * *

The new "Empire State" on the New York Central

(*Turn to next left-hand page*)

90 to 95% Mechanical Efficiency

WITH

The unusually high mechanical efficiency of a locomotive equipped with the Franklin System of Steam Distribution is one of the reasons why it can deliver 35 to 45% more power at 70 to 80 miles per hour.

*From 90 to 95% of the horse power developed by the cylinders in the operating range is delivered at the rails. Locomotives equipped with the Franklin System of Steam Distribution have the highest mechanical efficiency of any prime movers in railroad service.

FRANKLIN RAILWAY SUPPLY COMPANY, INC. NEW YORK CHICAGO

In Canada: FRANKLIN RAILWAY SUPPLY COMPANY, LIMITED, MONTREAL

Supply Trade Notes

H. L. HAMILTON, president of the Electro-Motive Corporation, has been elected a vice-president of the General Motors Corporation.

◆

J. ROGERS DAVIS, who joined the Chicago Pneumatic Tool Company in December, has been appointed supervisor of branches, a newly created office, to assist in the sales activities of the company's district and sub-district offices.

◆

FRANK L. MURPHY has been appointed chief engineer of the Pullman-Standard Car Manufacturing Company, in charge of all engineering of railway cars and transit equipment, with headquarters at the Pull-

Frank L. Murphy

man Car Works, Chicago. Mr. Murphy was born in Chicago on November 25, 1900, and graduated in mechanical engineering from Purdue University in 1922. He immediately entered the railway car manufacturing field as a freight-car draftsman for Pullman and has continuously served the Pullman organization since that time, devoting most of his effort in recent years to the passenger-car field. In January, 1928, he became assistant to the passenger-car engineer. In 1932, and for a number of years, he specialized in adapting mechanical air conditioning to both Pullman and railroad cars. In 1935, he was appointed principal engineer at the Pullman Car Works, and in 1940 assumed the duties of acting chief engineer.

◆

BALDWIN LOCOMOTIVE WORKS.—Four divisional vice-presidents have been appointed as follows: *Haldwell S. Colby,* locomotive division; *Frank K. Metzger,* Standard Steel Works division; *Frederick G. Schranz,* Baldwin-Southwark division, and *Norris H. Schwenk,* Cramp Brass and Iron Foundries division. The duties of these men will remain substantially the same as in the past. Other appointments in the company's locomotive division include that of *Amos G. Cole* as works manager, and *Lewis W. Metzger* as production manager, reporting to Mr. Colby. *Ralph W. Anderson,* formerly superintendent of motive power of the Chicago, Milwaukee, St. Paul & Pacific, has been appointed assistant to Mr. Colby, with particular reference to steam-locomotive construction.

◆

MCKENNA METALS COMPANY.—*Bennett Burgoon, Jr.,* formerly mechanical engineer of the Railway Steel Spring division of the American Locomotive Company at Latrobe, Pa., has been appointed representative for the McKenna Metals Company at Rockford, Ill. *W. L. Kennicott,* previously sales manager at Los Angeles, Calif., is now at Latrobe, Pa., in the management of sales and engineering of Kennametal tools and their applications.

◆

COPPERWELD STEEL COMPANY.—The Copperweld Steel Company has opened a district office at 122 South Michigan avenue, Chicago, under the supervision of *W. W. Ege,* who has been appointed western sales manager. Heretofore, Copperweld sales activities in this district have been handled by Steel Sales Corporation's Copperweld department in charge of Mr. Ege. Copperweld territorial representatives in the Chicago district are as follows: *E. G. Elg,* assistant western sales manager, Chicago; *J. P. Gould,* Chicago; *H. V. Rathbun,* Kansas City, Mo.; *A. B. Leach,* St. Louis, Mo.; *R. C. Raasch,* Des Moines, Iowa, and J. J. Healy, Minneapolis, Minn.

◆

W. EDGAR HAMSHER, service engineer of the Hennessy Lubricator Company, has been appointed vice-president. Prior to joining the Hennessy Lubricator Company in 1923, Mr. Hamsher had been employed with the Pennsylvania at Chambersburg, Pa.

◆

OAKITE PRODUCTS, INC.—Two new divisions, closely correlated and supplementary to the railway service division, have been

T. R. Smith

added to the nation-wide field service staff of Oakite Products, Inc. The New England division, with headquarters in Hartford, Conn., is headed by *T. R. Smith,* division manager, who will supervise the activities of the eleven men comprising this division. The second new division is the St. Louis and Southwestern division, which will make its headquarters in St. Louis, Mo. *S. C. Shank* has been selected to fill the post of division manager and direct the activities of the twelve men of this division. Mr. Smith has served for the

S. C. Shank

past 16 years as an Oakite service representative in a major Eastern industrial area, while Mr. Shank has covered a Mid-Western territory since 1930.

◆

FRANK A. STREIFF has been appointed southeastern sales manager of the Southern Wheel division of the American Brake Shoe & Foundry Co., with headquarters at Portsmouth, Va., from which point he has represented the Southern Wheel and Brake Shoe and Castings divisions of this company since 1935. Mr. Streiff will continue to represent the Brake Shoe and Castings division.

◆

JERRY C. BLOOMFIELD has severed his connection with the Bettendorf Company and has been appointed district representative at Chicago for the Standard Car Truck Company.

◆

L. J. GARBER has been appointed a representative of the Buffalo Brake Beam Company and the Unit Truck Corporation, with headquarters at St. Louis, Mo.

Obituary

GEORGE H. GOODELL, manufacturers' agent at St. Paul. Minn., for the Q & C Co., the Cullen-Friestedt Company, the Northwestern Motor Car Company, the National Lock Washer Company, the Edgewater Steel Company, the Standard Car Truck

(Continued on next left-hand page)

cut down on the arch and you boost the fuel bill

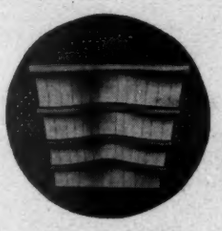
No one questions locomotive Arch economy. The Arch has been so thoroughly proved as a fuel saver by railroad after railroad for years past.

In the urge for money saving don't let the desire to save a few dollars in Arch brick expense, by skimping on the Arch, blind you to the fact that every dollar thus "saved", boosts the fuel bill ten dollars.

The surest way to the lowest operating cost is not in crippling proved economy devices but in making full use of them. This means complete Arches, with every brick in place, for each locomotive that leaves the roundhouse.

HARBISON-WALKER REFRACTORIES CO.

Refractory Specialists



AMERICAN ARCH CO.
INCORPORATED
60 EAST 42nd STREET, NEW YORK, N. Y.
Locomotive Combustion Specialists

Company and the Standard Railway Equipment Company, died in that city on December 27.

◆

CLAUDE C. CUEMAN, a designer of locomotives for the American Locomotive Company, died December 28 at his home in Ridgewood, N. J. He was 61 years of age.

◆

GEORGE COOK KIMBALL, a director and executive vice-president of the United States Steel Corporation, a director and president of the Illinois Steel Company, and a director and executive vice-president of the Carnegie-Illinois Steel Corporation, with headquarters at Chicago, died on January 12 at the Passavant hospital in that city after an illness of about a year. Mr. Kimball was born at Newtonville, Mass., on October 13, 1879, and graduated from Harvard University in 1900. The following year he entered the steel industry in the engineering department of the American Tin Plate Company at Pittsburgh, Pa., and in 1905 was appointed chief engineer of the American Sheet & Tin Plate Co. In 1931, he was elected a vice-president and in June, 1932, was elected vice-president of the Illinois Steel Company, with headquarters at Chicago. When the Carnegie-Illinois Steel Corporation was formed

George Cook Kimball

in 1935, Mr. Kimball became executive vice-president in charge of the Chicago district and in April, 1939, he was elected executive vice-president at Chicago of the United States Steel Corporation.

◆

ERNEST LUNN, mechanical engineer of the Super-Gear Drive Corporation, Chicago, and at one time electrical engineer of the Pullman Company and later of the Pullman - Standard Car Manufacturing Company, died at his home in Chicago on January 6, after an illness of about a week.

◆

ARTHUR AIGELTINGER, vice-president of the American Brake Shoe & Foundry Co., New York, died on December 30. Mr. Aigeltinger began his career with the Manganese Steel Rail Company in 1908, holding successively the positions of chief engineer, vice-president and president. In 1918 he retired from that company to become vice-president of the American Malleables Company, of which he was president from 1922 until its dissolution in 1936. Meanwhile, he had been appointed assistant to the president of American Brake Shoe & Foundry, the parent company, in 1929. He was elected vice-president in 1934.

Personal Mention

General

GEORGE H. EMERSON, chief of motive power and equipment of the Baltimore & Ohio at Baltimore, Md., who retired on January 1 as announced in the January issue, entered railway service in 1880 as water boy on the Willmar division of the Great Northern and in April, 1882, became an apprentice at the St. Paul shops. In October, 1887, he became a boilermaker and from September, 1890, to February,

George H. Emerson

1895, served as fireman and engineer, Dakota division. Mr. Emerson was locomotive foreman at Glasgow, Mont., from 1895 to 1897, then becoming general shop foreman and master mechanic, Dakota and Northern divisions. In January, 1900, he was appointed general master mechanic of the Western district and in 1903 became superintendent motive power. He was appointed assistant general manager of the Great Northern in March, 1910, and general manager in October, 1912. From October, 1917, to January, 1920, Mr. Emerson was Colonel in command, Russian Railway Service Corps in Siberia. He was appointed chief of motive power and equipment of the Baltimore & Ohio in March, 1920.

HOWARD HILL, master mechanic of the Philadelphia (Pa.) division of the Reading who has been appointed assistant superintendent of motive power and rolling equipment at Reading, Pa., as announced in the

Howard Hill

January issue, was born at Philadelphia, Pa., on June 15, 1890. He entered the service of the Reading as a machinist in 1914, at Philadelphia. He was promoted to assistant foreman in 1917; to enginehouse foreman at Philadelphia on January 1, 1933; assistant master mechanic on September 1, 1936, and to master mechanic of the Philadelphia division on July 1, 1938.

JOHN J. TATUM, assistant chief of motive power and equipment of the Baltimore & Ohio at Baltimore, Md., who retired on

John J. Tatum

January 1, as announced in the January issue, was born at Baltimore, Md., on September 17, 1866, and entered railroad service in 1879 as messenger boy in the Mount Clare shops of the Baltimore & Ohio. For a few years he worked in the locomotive building and repair shops, but in

1881 he became an apprentice in the car department and in 1885 became a car builder. Later he served in various supervisory capacities in the car department and in 1907 was appointed superintendent of freight-car equipment. During government control of the railroad during the first World War Mr. Tatum was manager of the car repair section of the United States Railroad Administration. On March 1, 1920, he returned to the Baltimore & Ohio as superintendent, car department, in charge of both passenger and freight equipment. He was appointed general superintendent of the car department on June 1, 1925, and on June 14, 1937, was appointed assistant chief of motive power and equipment. Mr. Tatum was elected chairman of the Mechanical Division, A. R. A., in June, 1924. He holds many patents and copyrights for improvements to railroad equipment. A few of his accomplishments are discussed in the item published on page 458 of the October, 1941, *Railway Mechanical Engineer*, at the completion of his seventy-fifth birthday and his sixty-second year of consecutive service on the B. & O.

ERNEST P. GANGEWERE, assistant superintendent of motive power and rolling equipment of the Reading, who has been promoted to superintendent of motive power and rolling equipment of the Reading and Central of New Jersey, with headquarters

Ernest P. Gangewere

at Reading, as announced in the January issue, was born at Bethlehem, Pa., on November 17, 1900, and attended high school at Chattanooga (Tenn.). During 1917 and 1918 he worked as an apprentice in the machine shop of the Wheland Machine Company at Chattanooga and later attended Lehigh University, receiving the degree of mechanical engineer in 1922. Mr. Gangewere entered the service of the Reading in July, 1922, as a special apprentice on the staff of the assistant superintendent motive power, subsequently becoming motive-power inspector. During this time he completed an air-brake instruction course with the International Correspondence Schools. In 1925, he was promoted to mechanical supervisor and from 1927 to 1933 served successively as enginehouse foreman at Saucon Creek, Bethlehem, Pa., and assistant master mechanic at Philadelphia, Pa. In 1933, he was appointed assistant superintendent of the Reading locomotive shop and on January 1, 1930 was appointed assistant superintendent of motive power and rolling equipment.

GEORGE H. MASSY, division master mechanic on the Central of New Jersey, with

George H. Massy

headquarters at Jersey City, N. J., who has been promoted to the position of assistant superintendent of motive power and rolling equipment, at Elizabethport, N. J., as announced in the January issue, was born at Jamaica, British West Indies, on April 25, 1889. He entered the service of the Central of New Jersey as a helper apprentice on March 25, 1908, and was promoted to machinist in 1910. In 1916, he became assistant foreman, Bayonne (N. J.) enginehouse; on August 1, 1925, enginehouse foreman at Elizabethport engine terminal; on March 17, 1926, general mechanical inspector, New York; on March 1, 1929, assistant master mechanic at Communipaw (N. J.) engine terminal, and on January 1, 1933, division master mechanic in charge of the Central and Southern sub-divisions.

H. T. COVER, superintendent of the Wilkes-Barre division of the Pennsylvania with headquarters at Sunbury, Pa., has been promoted to superintendent of

H. T. Cover

freight transportation, Eastern region. Mr. Cover was born at Altoona, Pa., on August 25, 1897, and entered railway service in August, 1915, with the Pennsylvania, serving for two weeks as laborer at Altoona. He then served successively as boilermaker helper in the Juniata shops, draftsman in the office of the general superintendent motive power, special apprentice in the Altoona machine shop, motive power inspector, assistant shop foreman on the New York division, foreman on the same division, shop foreman on the Philadelphia Terminal division and at the East Altoona enginehouse. On January 1, 1931, Mr. Cover became assistant master mechanic of the Maryland division, and was promoted to master mechanic of the Buffalo division on November 1, 1934, being transferred to the Maryland division on April 16, 1937. He served as master mechanic of the Columbus, Cincinnati and Toledo divisions from July 1, 1939, to January, 1940, when he was promoted to superintendent of the Wilkes-Barre division at Sunbury.

R. C. HEMPSTEAD, district master mechanic of the Chicago, Milwaukee, St. Paul & Pacific, at Milwaukee, Wis., has been promoted to the position of assistant superintendent of motive power, with the same headquarters. Mr. Hempstead was born at Nevada, Iowa, on August 5, 1884, and entered railway service on the Chicago & North Western in May, 1900, as an enginehouse laborer, later serving as machinist apprentice, machinist and enginehouse foreman. From 1910 to 1912 he served as a machinist on the Northern Pacific; the Minneapolis, St. Paul & Sault Ste. Marie, and the Minneapolis & St. Louis. He re-

Ralph C. Hempstead

turned to the North Western in the latter year as enginehouse foreman at Norfolk, Neb. On January 1, 1913, Mr. Hempstead went with the Milwaukee as a machinist at Chicago, later being promoted to enginehouse foreman at Tomahawk, Wis., and Wausau. In September, 1918, he was promoted to master mechanic of the Hastings and Dakota division, with headquarters at Aberdeen, S. D., and a year later was transferred to Madison, Wis. In September, 1920, he was transferred to Ottumwa, Iowa, and in March, 1927, was transferred to Dubuque, Iowa. Mr. Hempstead was appointed superintendent of the Milwaukee (Wis.) locomotive shops and foundries in November, 1928. In August, 1933, his title was changed to district master mechanic, with headquarters at Milwaukee, and his jurisdiction was extended to include the Milwaukee, Superior and Madison divisions.

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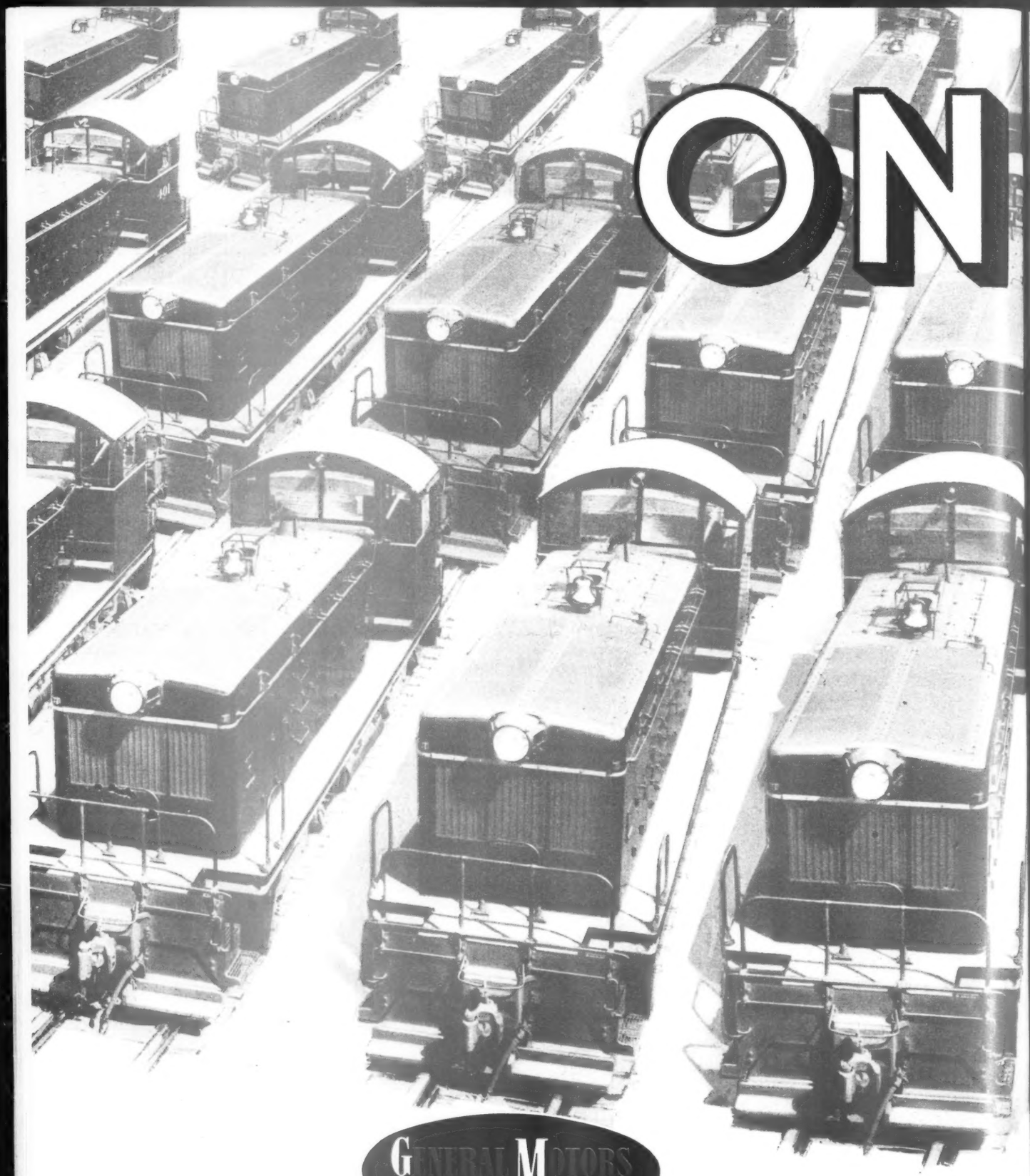

GENERAL MOTORS
LOCOMOTIVES

WHO SERVES THE RAILROADS—SERVES AMERICA!

ELECTRO-MOTIVE
GENERAL MOTORS CORPORATION

GUARD

ON LAND, on sea, and in the air, America's armed forces are "ON GUARD" defending the lives and property of our people. Behind the lines, the fastest possible movements of men, equipment and supplies are vital.

General Motors Diesel locomotives in all classes of service are playing an important part. Since one tank car of fuel oil in a GM Diesel Switcher will do the work of twelve cars of oil or coal in a steam switcher, and since GM Diesel locomotives in all classes of service are replacing two to four times as many steam locomotives, thousands of freight cars and hundreds of steam locomotives are available for other service.

MODERNIZE TO MOBILIZE WITH GM DIESELS

Master Mechanics and Road Foreman

W. B. JONES has been appointed acting master mechanic of the Utah Railway, with headquarters at Provo, Utah.

RICHARD KLING has been appointed assistant master mechanic on the Missouri Pacific at Kansas City, Mo.

J. N. FOX, master mechanic on the Illinois Central at Jackson, Tenn., has been appointed superintendent of equipment at Chicago.

J. L. MADENFORT, enginehouse foreman on the Reading at Newberry Junction, Pa., has been promoted to the position of master mechanic of the Shamokin division at Tamaqua, Pa.

J. S. FENNELL, JR., master mechanic of the Shamokin division on the Reading at Tamaqua, Pa., has been promoted to the position of master mechanic of the Philadelphia division at Philadelphia, Pa.

D. L. MCMILLAN, assistant master mechanic at the Markham terminal (Chicago) of the Illinois Central, has been appointed master mechanic at Champaign, Ill.

M. G. STEWART, assistant road foreman of engines of the Williamsport division of the Pennsylvania, has been promoted to road foreman of engines of the Washington Terminal company.

R. F. SMALLEY, general foreman on the Central of New Jersey at Communipaw engine terminal, Jersey City, N. J., has been appointed division master mechanic in charge of the central and southern subdivisions, with the same headquarters.

W. J. COLCORD, assistant road foreman of engines of the Maryland division of the Pennsylvania, has been promoted to road foreman of engines of the Delmarva division.

M. H. LOSCH has been appointed master mechanic of the Illinois and Missouri divisions and the Dupo terminals of the Missouri Pacific and of the Missouri-Illinois with headquarters at Dupo, Ill.

F. L. KING, enginehouse foreman on the Chicago, Milwaukee, St. Paul & Pacific at Milwaukee, Wis., has been promoted to division master mechanic at La Crosse.

ALEC M. MARTINSON, division master mechanic on the Chicago, Milwaukee, St. Paul & Pacific at La Crosse, Wis., has been promoted to district master mechanic at Milwaukee.

R. H. SMITH has been appointed master mechanic on the Nashville, Chattanooga & St. Louis at Bruceton, Tenn.

L. H. MCDANIEL, master mechanic of the Louisville & Nashville at Bruceton, Tenn., retired on December 31.

A. G. GEBHARD, trainmaster on the Illinois Central at McComb, Miss., who has been appointed to the newly created position of master mechanic, Diesel and electrical equipment at Chicago, as announced in the December issue, was born on August 20, 1897, as East St. Louis, Ill. Mr. Gebhard, after attendance at high school, entered railway service on October 5, 1914, as a machinist apprentice with the Terminal Railroad Association at St. Louis, Mo. He then served successively as a machinist in the employ of the Terminal Railroad at Brooklyn, Ill.; the Pennsylvania; the Illinois Central; the Laclede Steel Company at Madison, Ill.; the Wiggins Ferry Company; the Illinois Central; the National Stock Yards at St. Louis, Mo.; the Laclede Steel Company; the Illinois Central; and the Eagle Pitcher Lead Company. He again returned to the Illinois Central as a machinist and successively became enginehouse foreman; division air brake foreman; general foreman; master mechanic, trainmaster, and master mechanic, Diesel and electrical equipment.

A. G. Gebhard

Car Department

W. E. HARMISON, assistant to the superintendent of the car department of the Erie at Cleveland, Ohio, has been appointed superintendent of the car department, with the headquarters at Cleveland.

FRANK H. BECHERER, assistant superintendent of motive power and rolling equipment of the Central of New Jersey at Elizabethport, N. J., has been appointed superintendent of the car department on the Baltimore & Ohio with headquarters at Baltimore, Md.

Shop and Enginehouse

K. E. FOGERTY, general boiler inspector of the Chicago, Burlington & Quincy, Lines East, with headquarters at Chicago, retired on January 1 after 56 years of service.

E. G. STANEIFORTH, boiler foreman of the Denver shop of the Chicago, Burlington & Quincy, has been promoted to general boiler inspector, Lines East, with headquarters at Chicago.

JULES C. BROWN, mechanical foreman of the Cotton Belt Railway at Mt. Pleasant, Texas, retired on December 1, 1941, after 61 years of continuous service with the company. Mr. Brown was the oldest employee in point of service on the entire Cotton Belt System. He is 76 years of age.

Obituary

WILLIAM FREDERICK KUHLKE, superintendent of motive power of the Charleston & Western Carolina, with headquarters at Augusta, Ga., died at his home in that city on December 31.

JOHN E. HORRIGAN, who retired on May 1, 1931, as superintendent of motive power of the Elgin, Joliet & Eastern, with headquarters at Joliet, Ill., died on January 8 at his home in that city. Mr. Horrigan was born at Mendota, Ill., on June 23, 1860. He entered railway service in 1877, as a machinist apprentice on the Iowa Central (now part of the Minneapolis & St. Louis), and later advanced successively to machinist, enginehouse foreman, and master mechanic at Keithsburg, Ill. On May 1, 1893, he went with the Chicago, Rock Island & Pacific as enginehouse foreman at Blue Island, Ill., and the following year became master mechanic on the E. J. & E. at Joliet. Mr. Horrigan was appointed superintendent of motive power at Joliet on May 15, 1899.

PAUL L. MULLEN, assistant superintendent of motive power of the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Milwaukee, Wis., died suddenly in that city on January 5. Mr. Mullen was born at Indianola, Iowa, on February 13, 1886, and entered railway service in 1902, as a call boy on the Milwaukee at Perry, Iowa, later serving as a machinist apprentice at Perry and Dubuque. In 1906, he was promoted to machinist at Perry and in 1907, was advanced to assistant enginehouse foreman. From 1909 to 1916, he served as enginehouse foreman at Council Bluffs, Iowa, Ottumwa, Perry and Savanna, Ill., and in the latter year he was promoted to assistant general foreman at Sioux City, Iowa. Mr. Mullen was appointed master mechanic at Austin, Minn., in 1918 and in 1920 was transferred to Savanna.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers. State the name and number of the bulletin or catalog desired, when it is mentioned.

MEEHANITE METAL.—Meehanite Metal Corporation, 311 Ross street, Pittsburgh, Pa. Use business letterhead and give title when requesting copy. Nominal price, $1. 48 pages, spiral bound. A description of the metallurgy and interpretation of the engineering properties of the various types of Meehanite metal and their applications in industry.

HANDBOOK OF SLEEVE BEARINGS.—Federal-Mogul Corporation, Shoemaker and Lillibridge streets, Detroit, Mich. Handbook of eleven sections, by Albert B. Willi, discusses the effect of design, alloys, and manufacturing methods upon sleeve-bearing efficiency and defines the field of application for each basic type of sleeve bearing. Available only to those directly concerned with sleeve-bearing installations.